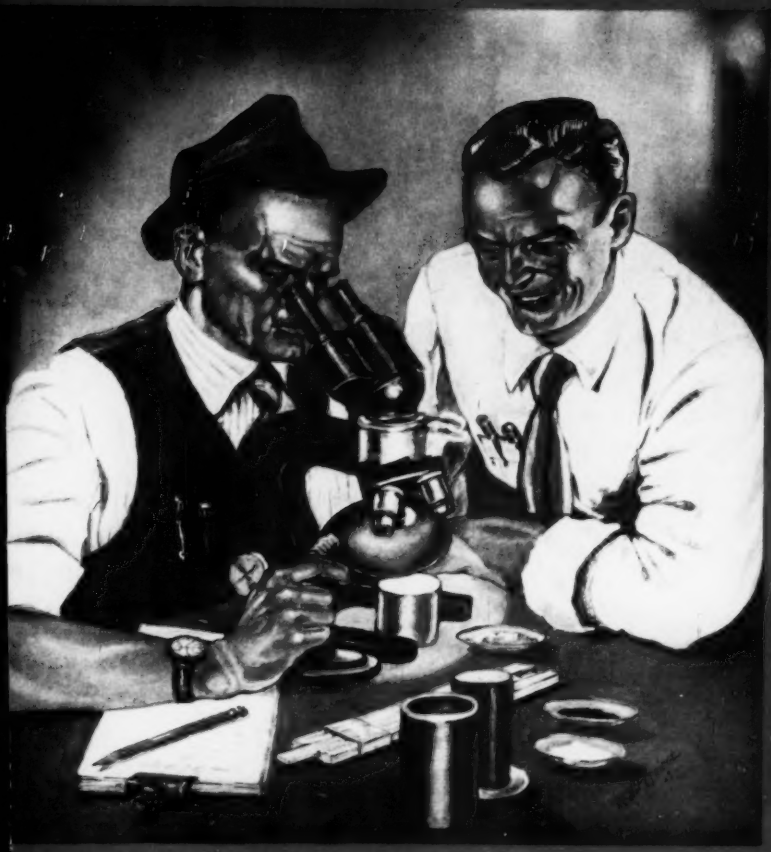
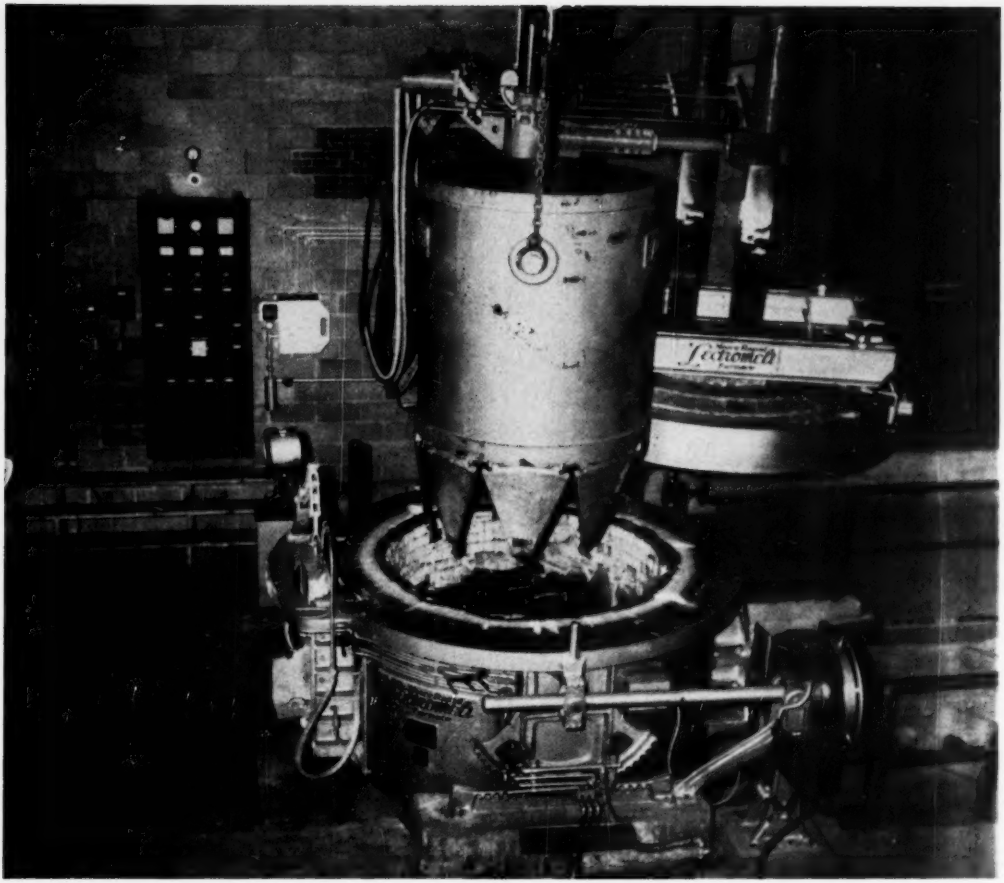
SEPTEMBER 1949

American Foundryman



THE FOUNDRYMEN'S *Own* MAGAZINE



UNPRODUCTIVE down time is cut to a matter of minutes by the top charging feature of this Size CQT Moore Rapid Lectromelt Furnace. Time consuming hand furnace loading is completely eliminated and charging becomes a routine affair of swinging the roof aside, dumping the charge and replacing the roof. As a result single turn foundry production on this size Lectromelt regularly reaches 16 tons.

The Lectromelt CQT has an acid steel hourly rating of two tons. Most operators regularly pour four ton heats, with some going as high at eight tons. The CQT has a KVA rating of 1600 to 2000.

Lectromelt furnaces are available in sizes ranging from 100 tons to 250 pounds. Write today for complete details.

PITTSBURGH LECTROMELT FURNACE CORPORATION
PITTSBURGH 30, PENNSYLVANIA

MOORE RAPID
Lectromelt
FURNACES

manufactured in: CANADA, Lectromelt Furnaces of Canada, Ltd., Toronto 2; ENGLAND, Birlec, Ltd., Birmingham; SWEDEN, Birlec Elektkougnar A B, Stockholm; AUSTRALIA, Birlec Ltd., Sydney; FRANCE, Stein et Roubaix, Paris; BELGIUM, S. A. Belge Stein et Roubaix, Bressoux-Liege; SPAIN, General Electricc Espanola, Bilbao; ITALY, Forni Stein, Genoa

Why reach for the moon?

THERE'S NO CLAY UP THERE, ANYWAY . . .
WHEN FOUNDRYMEN REACH FOR THE FINEST
CLAY BOND AVAILABLE, THEY REACH FOR

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GREEN BOND

Best of the Wyoming Bentonites

THE FEDERAL FOUNDRY SUPPLY COMPANY

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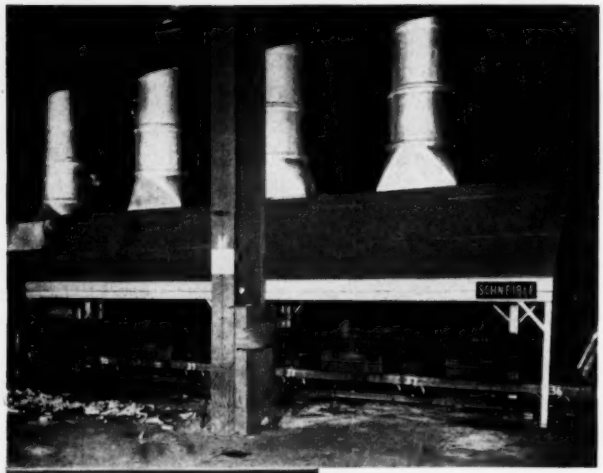
MOLD SMOKE CONTROL . . .



TO *Cope* WITH ANY CONDITION

FOUNDRY PROVED... the Schneible-designed and Schneible-built "Open Side" Mold Conveyor Hood *with Compensating Air Principle!*

"Open Side" permits observation of molds in transit, easier spillage removal, easier conveyor maintenance.

"Compensating Air Stream" on open side of hood forces continuous exhausting through stacks—prevents smoke and heat from contaminating the foundry fresh air.

"Lower in Height"—better visibility and more accessible.

Better working conditions—more comfort for workers—write for illustrated literature.

CLAUDE B. SCHNEIBLE COMPANY
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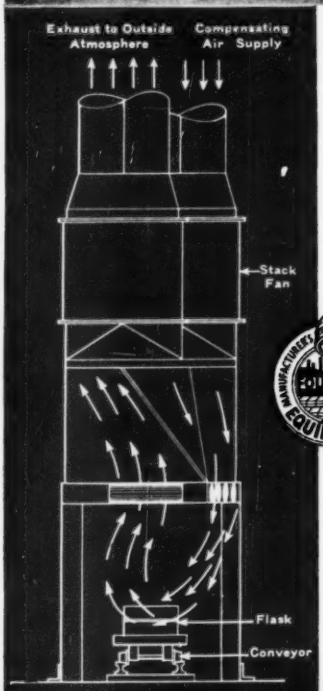
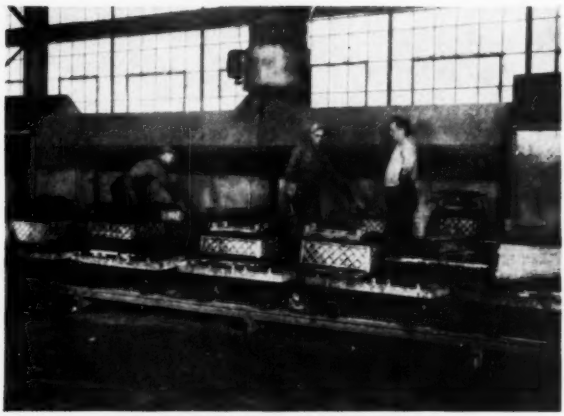


Mold Smoke Hoods and dump-off ventilation, part of a Schneible System on snap flask work in a malleable iron foundry.



Clamp and weight removal station of mold conveyor, equipped with Schneible Uni-Flo Hood. Mold Smoke hoods at each end have ventilation. Similar hoods are used at points on conveyor where pouring heads are broken out.

U. S. and Foreign Patents Pending

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SEPTEMBER, 1949

VOLUME XVI, NUMBER 3

American Foundryman

September, 1949

Official publication of American Foundrymen's Society

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Regional Foundry Conference Programs Stress Nodular Graphite Cast Iron
FEF To Add Five Universities
"Bottom-Up" Management: William B. Given, Jr.
Standard Test Sand Selected: R. E. Morey
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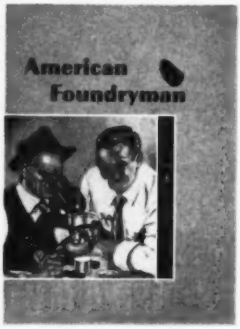

This Month's Cover

The cover illustration is a reproduction of a poster done in pastel chalks by William O. McFatridge, superintendent of foundry at International Harvester Co.'s Farmall Works, Moline, Ill. The story of how McFatridge has combined his artistic talents and technical skill into an interesting career is told on Page 70 of this issue.

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York Corporation
for finer finish
The York Corporation, manufacturer of refrigeration and air conditioning units, and operator of large iron foundries, is a regular user of No. 172 Mexican Blacking to produce castings with a *better finish and reduce foundry production costs*. No. 172 is a high quality wet blacking, containing a binder, that can easily be applied to cores and dry sand molds with spray, brush, or swab. It permits the sand to peel freely, leaving a smooth-surfaced casting *that requires minimum cleaning*. No. 172 Mexican Blacking is recommended for medium, extra large and pressure castings weighing 1 to 25 tons. No. 172 is also an excellent core coating. Only water is required to prepare for use. Other Mexican Graphite products include Cordip —for dipping or spraying dry or green sand cores— and Mexacote—for cores and molds in light and medium production casting where extra resistance to high temperature metal is demanded.
THE UNITED STATES GRAPHITE COMPANY

uses Blacking on castings

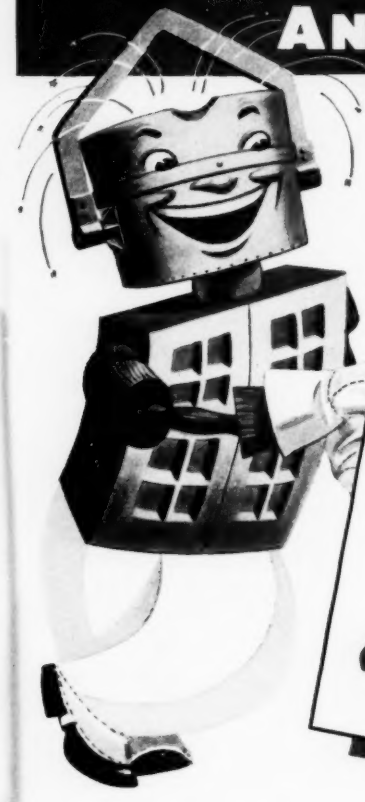
Three stages of mold preparation at the York Corporation with No. 172 Mexican Blacking. (1)—Mold being sprayed with No. 172. (2)—Mold ready for drying after spraying. (3)—Sprayed mold torch dried and ready for casting.

A typical casting produced U. S. Graphite No. 172 Mex Blacking at the York Corporati Note the fine finish and overall clean appearance of the casting.

No. 172 Mexican Blacking

DIVISION OF THE WICKES CORPORATION • SAGINAW, MICHIGAN

GET THESE 4 BIG HELPS IN MAKING FINER CORES AND CASTINGS



1 GET MORE GREEN STRENGTH

2 IMPROVE FLOWABILITY AND TEXTURE

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4 GET EASY BURN-OUT, COLLAPSIBILITY

For better, lower cost cores place a trial order for Krause Cereal Binders now — TRUSCOR if you like light weight; AMERIKOR if you prefer a heavier weight.

Order through any of the distributors below or write direct to CHAS. A. KRAUSE MILLING CO., Milwaukee 1, Wisconsin.
World's largest dry corn millers.

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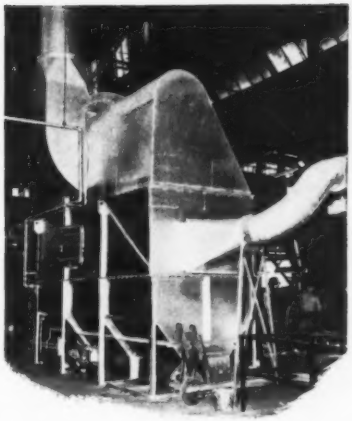
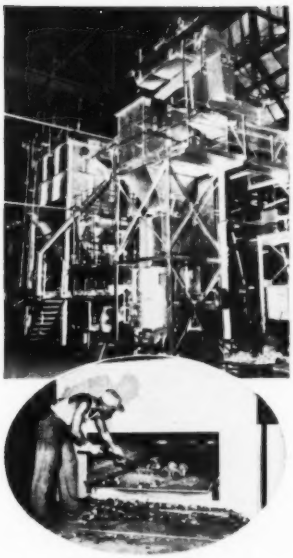
DUST IS OUT AT OHIO BRASS!



Roto-Clone dust control helps make modern foundry a model for cleanliness and efficiency



No dust here! Shakeouts and sand reconditioning plant of Ohio Brass foundry served by Type N Roto-Clone.

THIS malleable iron foundry at Ohio Brass Company, Mansfield, Ohio, is completely mechanized for production line operation. And as for dust—there just isn't any with a Type N Roto-Clone* at work. The unit, pictured above, serves both automatic shakeouts and the sand reconditioning plant. The moment dust is generated it's on the way out—out of the air into the Roto-Clone.

The Type N Roto-Clone offers truly mechanized dust control. This Hydro-Static Precipitator delivers high efficiency dust separation and collection by a combination of centrifugal force and thorough scrubbing of the air by a water curtain. The unit operates with a minimum of attention and, by exhausting a constant air volume, assures effective dust removal at all times. Secondary dust problems are eliminated completely by the Type N as the collected material is discharged as a sludge for easy disposal.

Dust costs you dollars every day it has free run of your plant. It can be controlled effectively, economically by Roto-Clones. There's a type and size to fit every need from stand grinder to electric furnace. For complete information, call your nearby AAF representative or write direct for Roto-Clone Bulletin No. 277-A.

AMERICAN AIR FILTER COMPANY, INC.
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®AAF

ROTO-CLONE®
DUST CONTROL EQUIPMENT

**Roto-Clone is the trade-mark (Reg. U.S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydrostatic precipitator types.*

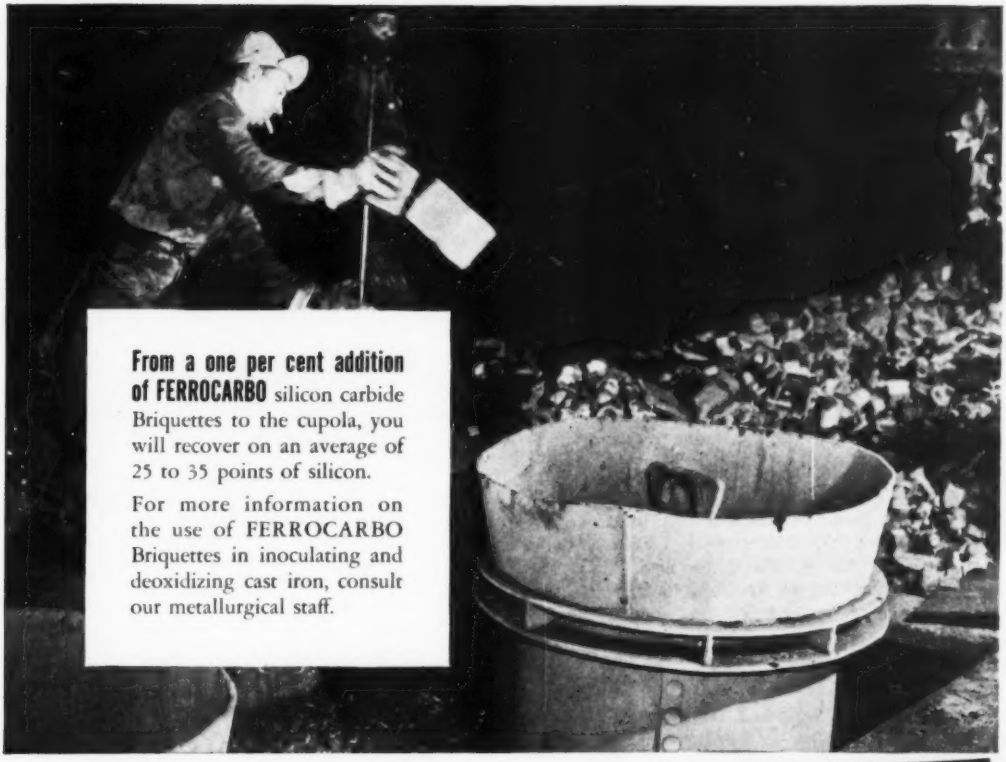
UNIVERSAL FLASK PINS, BUSHINGS, and CLOSING PINS for perfect alignment of cope and drag

Here is a team that has helped eliminate cope and drag problems in many foundries—Universal Flask Pins, Bushings and Closing Pins. Cope Bushings are quickly guided to the Drag Pins over tapered, loose-fitting Closing Pins which are quickly removed after assembly. Special design of Elongated Flask Bushing permits longitudinal expansion to compensate for metal heat, without affecting accurate alignment. Round, elongated, press fit and taper types for cast iron, steel, aluminum and magnesium flasks are available for immediate delivery in several sizes. Special types and sizes to order. Write for complete information.

UNIVERSAL ENGINEERING COMPANY
FRANKENMUTH 12, MICHIGAN

Silicon Recovery from FERROCARBO Briquettes

BY **CARBORUNDUM**
TRADE MARK



From a one per cent addition of FERROCARBO silicon carbide Briquettes to the cupola, you will recover on an average of 25 to 35 points of silicon.

For more information on the use of FERROCARBO Briquettes in inoculating and deoxidizing cast iron, consult our metallurgical staff.

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Survey indicates Estimated Annual Return on Investment: **133%!**

Here are the facts and figures from a Thermex Comparative Core Cost Study of the oven-equipped core room in a New York manufacturer's foundry . . . typifying the remarkable savings to be had with Thermex High Frequency Core Baking Equipment.

Present Operating Cost (including labor, material, and fuel): $259.76 per day. Estimated Operating Cost using Thermex Model 1,000C Core Baking Equipment: $184.76. Annual Operating Savings (250 days): $18,750. Floor Space Savings (800 square feet at $1.25 per square foot): $1,000 annually. Total Annual Savings: $19,750. *Estimated Annual Return on Investment: 133%!*

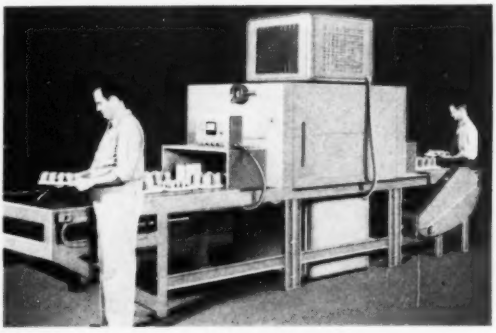
Other examples of the remarkable savings that can be effected with Thermex high frequency Core Baking Equipment are indicated by the excerpts below, taken from actual surveys* made by Thermex high frequency specialists.

LABOR SAVINGS

Based on installation of Thermex 500C unit, reducing man-hours from 130 to 88 per day. Present Labor Cost per day: $151.36. Estimated cost using Thermex equipment: $105.84. Annual Labor Savings (200 days): $9,104.

CORE MIX SAVINGS

Based on comparison between presently employed Oil Sand Mix and proposed Resin Sand Mix. Oil Sand Mix (22 batches @ $6.45): $141.90 per day. Resin Sand Mix (22 batches @ $6.03): $132.66 per day. Annual Core Mix Savings (250 days): $2,310.



FUEL SAVINGS

Based on 16 tons of cores per day. 16 tons at Fuel Oil cost of $3.00 per ton: $48.00. 16 tons at power cost of $0.892 per ton (including tube replacement cost): $14.27. Annual Fuel Savings at $33.73 per day: $8,432.50.

FLOOR SPACE SAVINGS

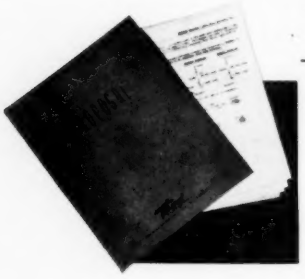
Based on installation of one Thermex Model 1,000C and one Thermex Model 500C. Total space now used for core making, excluding oven space: 5,400 square feet. Thermex equipment: 3,600 square feet. Annual Floor Space Savings at $1.50 per square foot: $2,700.

Thermex

(T. M. Reg. U. S. Pat. Off.)

THE GIRDLER CORPORATION • THERMEX DIVISION
LOUISVILLE 1, KENTUCKY

*Surveys containing above information on file with THERMEX.



Thermex will analyze your core costs without charge.

Thermex Comparative Core Cost Studies are made by authorized Thermex high frequency specialists following a preliminary investigation to determine the feasibility of high frequency core baking for your particular operation. There is no charge for this service, of course.

The study covers all phases of your operation and results are submitted in proposal form, including a detailed breakdown of all operating expenses, equipment costs, and suggested layout for your modernized core room. In it you will find all the facts you need to make a sound, economical decision.

Get in touch with Thermex soon. A Thermex Comparative Core Cost Study can very likely show you the way to profit-boosting core room economies!

A Voice from the Scrap Pile

MANY OF OUR DEFECTS CAN BE TRACED TO IMPURITIES IN MOLTEN METAL . . . WHY DIDN'T THE FOUNDRY USE FAMOUS CORNELL CUPOLA FLUX TO CLEANSE OUR METAL BEFORE WE WERE POURED?

Famous CORNELL CUPOLA FLUX

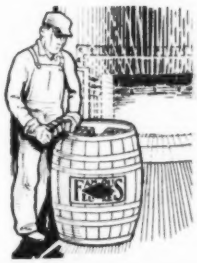
Purges molten metal of foreign matter so that you pour clean, hotter and more fluid iron. Greatly reduces sulphur.

By reducing chilled sides, hollow centers and hard spots, it plays an important role in eliminating many expensive makeovers.

Reduces cupola maintenance. Keeps cupolas cleaner. Drops are cleaner. And by reducing erosion of brick or stone, it prolongs the life of cupola lining.

Another big advantage is the PRE-MEASURED SCORED BRICK FORM which simplifies the use of flux and saves labor.

You toss Famous Cornell Flux into cupola with each ton charge of iron or break off one to three briquettes (quarter sections) for smaller charges—an operation that takes but a few seconds.



WRITE FOR BULLETIN No. 46-B

The CLEVELAND FLUX Company

1026-1034 MAIN AVENUE, N. W., CLEVELAND 13, OHIO

Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes—Since 1918

FAMOUS FLUXES Trade Mark Registered

Write for Bulletins

Famous CORNELL ALUMINUM FLUX

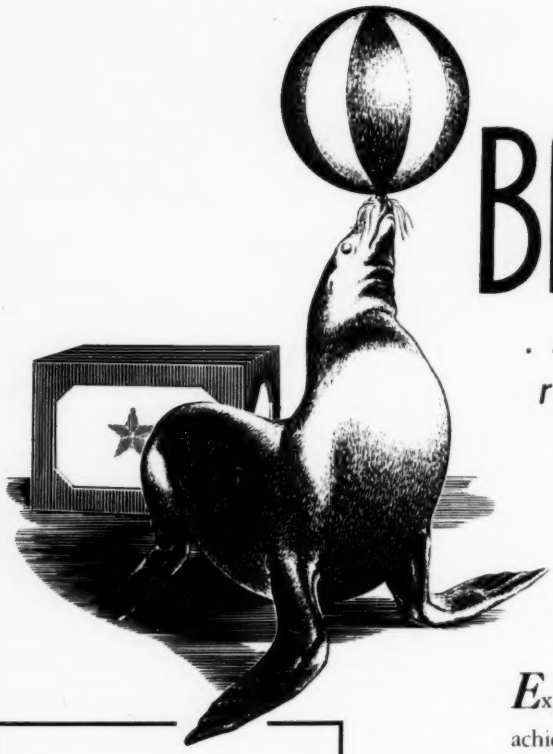
Produces clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections are poured. Castings take a higher polish. NO FUMES! Exclusive formula prevents obnoxious gases. Metal does not cling to dross.

Famous CORNELL BRASS FLUX

Makes metal pure and clean, even when dirtiest brass turnings or sweepings are used. Produces castings which withstand high pressure tests and take a beautiful finish. Saves considerable tin and other expensive metals. Crucible and furnace linings are preserved.

Famous CORNELL LADLE FLUX

Place a few ounces in bottom of ladle, then tap cupola. Metal is thoroughly cleansed, foreign impurities are easily skimmed off. Ladles are kept clean, there is less patching and increased ladle life. Metal temperatures are retained during transfer to molds.



BALANCING

. . . . it's easy with the right grade of silvery

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Kerchner, Marshall & Co.,
Union Commerce Bldg.
Pickands, Mather & Co.,
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*E*xperience proves a foundryman can easily achieve a properly balanced cupola charge when Globe Silvery Pig is available.

The knowledge and experience gained through the 75 years Globe has been supplying the foundry trade is yours for the asking. We'll help you select the type and grade of silvery that best suits your specific requirements.

Globe Silvery Pig is again available in any grade. Call or write us direct; or contact our sales agent listed nearest you.

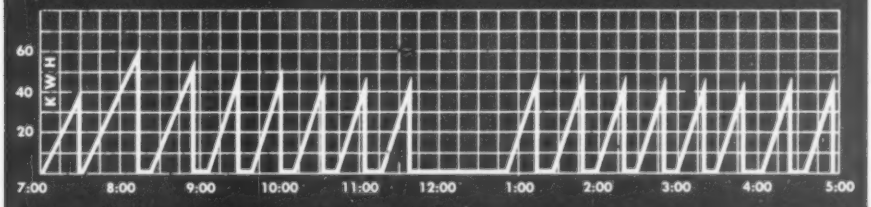
GLOBE Since 1872
SILVERY PIG

GLOBE IRON CO.

BLAST-FURNACE SILVERY PIG IRON • BESSEMER GRADES OF SILVERY, SPECIAL, ALLOY, HIGH-SILICON PIG IRONS FOR PARTICULAR APPLICATION

JACKSON, OHIO

DETROIT ROCKING ELECTRIC FURNACE



LFC—Brass

INSTALLATION—Three type LFC, 125 KW, 350 lb. nominal cold charge capacity Detroit Electric Furnaces in a Minnesota plumbing goods manufacturing company. Equipped with automatic rocking and electrode control.

OPERATION— Melt 350 lb. heats of 78% Cu, 13% Zn, 6½% Pb, 2½% Sn, and tapped into 400 lb. crucible. Operate 16 hours per day.

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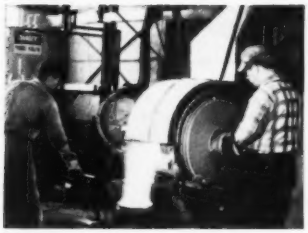

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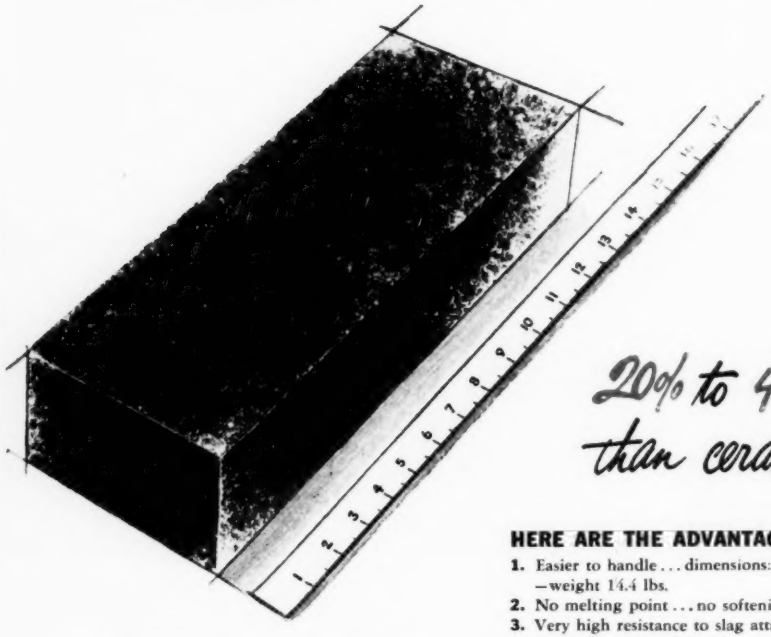

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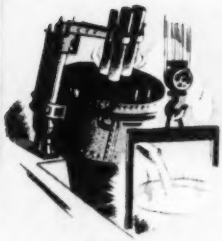

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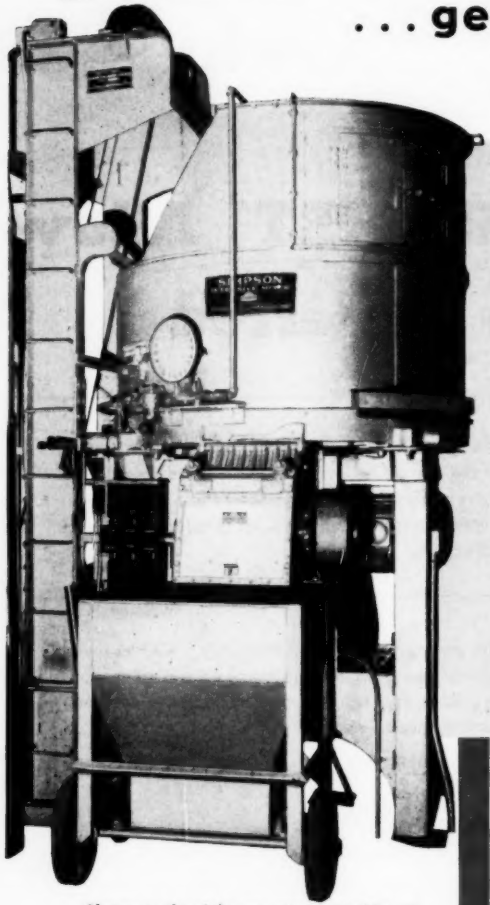

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SIMPSON MIXER MODEL	MAX. HORSE-POWER	BATCH SIZE IN POUNDS	2 MINUTE CYCLE	3 MINUTE CYCLE
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No. 3	50	3,000	90,000	60,000

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FOUNDRY TECHNOLOGY can meet TODAY'S CHALLENGE

THE PRESENT DAY competitive market is a challenge to all foundries to improve their product. Buyers of castings faced with the same competitive condition are becoming more critical of the material they are receiving and are increasingly turning to another foundry should the one they have been dealing with fail to meet requirements as to soundness, trueness to pattern, chemical, and physical properties, etc. Further, buyers are likely to look outside the foundry industry if the quality of customarily dependable and satisfactory castings deteriorates.

A scrapped casting is a financial loss to the foundry and to the customer. In many cases the loss to the customer is much greater than to the foundry because of the expensive machining put on the casting before scrapping; hence, the purchaser is going to be extremely critical of the raw castings he buys.

As a first step in combatting customer dissatisfaction it is logical that a careful analysis be made of returned castings to determine the cause of rejection. This suggestion may seem somewhat trite, but experience has shown that time after time the same defect appears in the same location in the replacement castings indicating unsatisfactory correction of faulty operating conditions.

A second step is to critically study the design of the casting, particularly as to whether it will produce a sound casting in the metal specified. Foundrymen are prone to be proud of their ability to cast almost anything offered them and sometimes try to do so regardless of cost, whereas some simple changes in design would produce a better casting at lower cost.

Almost all design engineers are willing to cooperate with the foundryman and are receptive to suggestions from him. They can, however, soon become disgusted with poor castings and will reluctantly turn to other methods of making the parts in which they are interested if the overall economics of the situation are more favorable. Many foundrymen are not taking advantage of the opportunity to cooperate with the designer. The cultivation of friendships between the two is always a good policy.

Another suggestion for the foundryman interested in maintaining and improving casting quality is to critically review his melting, sand, and molding practice in the light of present day knowledge. Too many foundrymen have spent considerable sums of money to improve their molding practice but have completely neglected their melting equipment and proper control. These foundrymen should remember that a poorly melted metal cast into the finest of molds will result in a poor or scrapped casting.

Publications and meetings of the American Foundrymen's Society cover to a large degree the modern developments in foundry practice. Information available through the Society—a technical organization which belongs to the world-wide foundry industry—is beyond value if put to use. All foundrymen should take advantage of the opportunity to use and further develop A.F.S. services, activities, and information, to the end that they will hold their own in an increasingly competitive market.

Thomas E. Eagan

THOMAS E. EAGAN
National Director
AMERICAN FOUNDRYMEN'S SOCIETY

National Director Thomas E. Eagan was elected at this year's Annual A.F.S. Convention in St. Louis and started his three-year term of office in July. Long active in the Gray Iron Division (he was chairman 1945-47.) Mr. Eagan has authored a number of papers which have appeared in Society publications and elsewhere. Chief metallurgist for Cooper-Bessemer Corp., Grove City, Pa., since 1934, he holds degrees from Columbia University (B.A., 1923) and Missouri School of Mines (Metallurgy, 1925, and Metallurgical Engineering, 1928). Before joining Cooper-Bessemer, he was with Simonds Saw & Steel Co., Lockport, N. Y., Crucible Steel Co., Harrison, N. J., in metallurgical capacities, and the Midvale Co. Philadelphia.

WHAT A. F. S. CHAPTERS are doing FOR FOUNDRY EDUCATION

ONE OF THE GREATEST SINGLE FACTORS in assuring the future of the foundry industry is the A.F.S. Chapter, working in conjunction with educators, industrialists, and the general public to promote better understanding of the castings industry. The work of A.F.S. chapters in the educational field covers many aspects—aid to students and Student Chapters, development of foundry courses at schools and colleges, establishment and maintenance of student loan funds, publicizing the foundry industry by means of exhibits, open houses, etc., as well as sponsoring educational courses for chapter members, conducting Regional Foundry Conferences, sponsoring participation in the A.F.S. Apprentice Contest, and other activities.

A significant example of a chapter's contribution to foundry education in the past year is that of the Western Michigan Chapter's rejuvenation of foundry courses at the Hackley Manual Training School, Muskegon, Mich.

Muskegon is a city whose foundry employees number more than one-fifth of the population—yet this "foundry town" offered not one course in foundry practice. The Hackley Manual Training School of Muskegon had some 20 years before discontinued such a course. Realizing the city's urgent need for training young men at the high school level, members of the A.F.S. Western Michigan Chapter set about reviving the Hackley School's foundry practice course. The task was not an easy one—industrialists and educators had to be interested in the project and funds had to be raised for new facilities and equipment.

Cooperation of the Muskegon Board of Education and the Muskegon Manufacturers' Association was obtained and a donor's group organized to raise funds for the project. An engineering group was appointed to prepare plans for a completely modern foundry layout to be installed in a wing of the school.

More than 50 foundries and foundry equipment manufacturers contributed time, money and equipment to the project; an instructor was hired, and within two years of its inception the Hackley Manual Training School foundry became a reality.

Today, Hackley offers high-school foundry education second to none. Its curricula include training in foundry fundamentals, patternmaking, mechanical drawing, laboratory technique and advanced foundry practice. Members of the Western Michigan Chapter act as advisors to the school's faculty, in keeping students abreast of latest foundry developments and in helping solve knotty casting problems that arise.

Good foundry housekeeping is emphasized at the Hackley Manual Training High School, Muskegon, Mich., whose foundry courses were revived by the A.F.S. Western Michigan Chapter after 20 years' dormancy.

Chapter Endows Student Loan Fund

The Western Michigan Chapter created in 1945 the Donald J. Campbell Educational Fund, named in honor of the late founder of the Campbell, Wyant & Cannon Foundry Co. The Fund consists of an endowment made available to deserving students to enable them to attend any Michigan college offering foundry engineering or metallurgy courses. Loans in any amount up to $750.00 are available to students who qualify. Preference is given to students from the Western Michigan Chapter area, but any Michigan student may qualify providing his schooling has included, in order of preference—(1) two years of college, (2) one year of college, (3) graduation from high school, or (4) graduation with an engineering degree (i.e., wishes to borrow from the fund for the purpose of undertaking post-graduate work in foundry or metallurgy).

At present, two students are availing themselves of the Campbell Educational Fund and five additional applications have been approved.

A project similar to that at The Hackley Manual Training School was undertaken last winter by the St. Louis District Chapter, whose members raised some $7,500 worth of new foundry equipment to enable the Missouri School of Mines and Metallurgy to offer a practical course in foundry instruction.

As in the Hackley project, foundries and foundry equipment manufacturers were asked to donate modern equipment for the course. The response brought forth such items as a gas-fired furnace, a sand mixer, a core oven, an arc furnace, molding machines, flasks, patterns and miscellaneous equipment.

The newly-established foundry course at the Missouri School of Mines has raised foundry education to such a level at the School that it will shortly be a

requisite for graduation from both the Metallurgical School and the Mechanical Engineering School.

Another closely related project in the educational field is that of the Western New York Chapter, which during the past year has been instrumental in the establishment of a tuition-free course in metallurgy for high school graduates at the New York State-sponsored Institute of Applied Sciences at Buffalo.

The two-year course in metallurgy was instigated largely through the efforts of the chapter's Educational Committee in response to demands from Buffalo industries. Thus, local industry receives an infusion of "new blood," while at the same time young men who could not otherwise afford an engineering education at the junior college level are given the opportunity to become metallurgical technicians.

Enthusiastic participation of members in Rochester Chapter's recent Defective Castings Recognition Contest proved that a thirst for foundry knowledge does not end with schooling or apprenticeship.

Members of the chapter act as consultants to the students and offer them on-the-job training during the school year and vacation periods. In addition, chapter members have been active in urging the New York State Board of Education to authorize a four-year extension course for apprentices, covering all phases of the foundry industry. This proposal, which is being considered by the Board, will, if approved, be a major factor in attracting young New Yorkers to the foundry.

The A.F.S. Central New York Chapter, invited some 50 vocational guidance directors and educators from high schools of the area to attend its April meeting, held at Cornell University, Ithaca, in collaboration with the Foundry Educational Foundation.

The purpose of the meeting was to acquaint high school educators and vocational guidance directors with the unlimited opportunities offered graduates of the area, either by going on to advanced courses in foundry technology at Cornell, or by entering directly into the foundry industry at the apprentice level. The meeting concluded with the chapter's regular monthly technical session, in which the value of foundry education was stressed.

Conducts Educational Meetings Series

Similarly, the A.F.S. Saginaw Valley Chapter conducts an annual series of educational meetings designed to help high school students obtain reliable information about the foundry industry and its opportunities for the high school graduate.

This year, there were three meetings in the series. The first was devoted to a discussion of the foundry industry's place in our economic life and to types of foundry training available. The second session included a talk, exhibit, and film on foundry materials and production. Concluding the series was a round table discussion on the making of a specific casting. Men representing all phases of the foundry industry participated in the discussion to illustrate the coordinated effort that goes into the making of a casting.

Aids Preparation of School Manuals

The A.F.S. Rochester Chapter has been promoting the preparation of a series of manuals on foundry instruction, covering a four-year course. The A.F.S Outline for Apprentice Training is serving as the basis for the series.

Another of the Rochester Chapter's activities last year was sponsorship of an open house at the Paul Revere Trade School, Rochester, last May, in which the public was shown methods of casting, foundry equipment and laboratory facilities. Cooperative efforts between the Revere Trade School and the chapter have proven highly successful in interesting Rochester youth in the foundry.

Not all educational activities of chapters during the year have been concentrated on the high school and college student, however. Chapter educational interests cover a broad field and this year as in the past have

Two young Michigan men who are being helped with their foundry education by loans from Western Michigan Chapter's Donald J. Campbell Educational Fund are (left) Marvin Wickham, and Donald Huitenga.

included training courses for chapter members—men who are already in the industry.

An outstanding example of this is the recent course for foundry supervisory employees conducted jointly by the A.F.S. Tennessee Chapter, the University of Tennessee and the Kirkman Vocational School, Chattanooga.

The course had as its instructors key men from Chattanooga-area foundries and consisted of 15 weekly two-hour classes in such subjects as history and background of the foundry industry, laboratory control and physical testing, molding and coremaking, sand and sand control, inspection and casting defects, and foundry equipment. Certificates for completion of the course were issued by the University of Tennessee.

This year, for second time, the Detroit Chapter included a course in public speaking as part of its educational program. Another phase of the program consisted of a series of four two-hour lectures on foundry fundamentals for high school students. During the month of April a series of discussions of defective castings was held for members.

Climaxing the year's educational activities was a "Father and Sons' Night," in which fathers attended with their sons of high school age or older.

Donate Foundry History to Libraries

Other activities on the part of chapters during the last year include the purchase of Bruce L. Simpson's DEVELOPMENT OF THE METAL CASTINGS INDUSTRY by members and member companies of the Northern California Chapter for distribution to California schools and libraries.

The A.F.S. Southern California Chapter, in cooperation with the local chapter of the American Society for Metals, last year sponsored a practical shop course in materials and methods at the East Los Angeles Junior College. The course dealt with metallurgical processing in the foundry, metal manufacturing and fabricating industries, and was taught by Los Angeles-area metallurgists.

The A.F.S. Central Illinois Chapter constructed an exhibit explaining the evolution of a casting from blueprint to finished product. Placed in the Commercial National Bank, Peoria, and later in the Peoria Vocational School, the exhibit attracted widespread interest in the industry and among the public.

Plans New A.F.S. Student Chapter

Several chapters have already announced extensive educational programs for the coming year. Among these is that of the Texas Chapter, now entering into its second year of educational work. Last year, the chapter was instrumental in the formation of an A.F.S. Student Chapter at Texas A & M College, and this year hopes to form another Student Chapter at the University of Texas.

A chapter committe has on two occasions visited both of these universities to observe their facilities and to discuss an educational program that would be suitable to the Texas area. School officials, impressed by the interest of the chapter, have agreed to add more foundry courses to the curricula of both schools this year. The schools have also sent out inquiries to determine the type of men desired by Texas foundries.

A practice which was established by the Texas Chapter last year and which will be continued this year is that of sending foundrymen to speak at the Texas A & M Student Chapter's monthly meetings.

The chapter plans this year to offer one scholarship at the University of Texas and one at Texas A & M College. Member companies have also established scholarships at the two schools, and in addition offer summer employment to students. Another of the chapter's activities during the past year was to pay the expenses of three student members of the Texas Chapter to the 53rd A.F.S. Convention, St. Louis.

The Texas Chapter Educational Committee, which will maintain contact with Texas universities and offer all possible assistance to students and faculty, consists of Charles Sibbett, Refinery Castings Co., Dallas; Gerald Smith, East Texas Electric Co., Longview; William Griffis, University of Texas, Austin; Lloyd Berryman, Texas A & M College, College Station; Marvin Williams, Hughes Tool Co., Houston; and Chairman Malcolm J. Henley, Texas Foundries, Inc., Lufkin.

Foundry instructors and students at Lane Technical High School work closely with the Chicago Chapter.

This year, the Northeastern Ohio Chapter has had a large and varied educational program. The Educational Committee, in cooperation with the Cleveland Trade School, has worked with senior and junior vocational schools of the Cleveland area in filling requirements for foundry materials and equipment.

Several thousand copies of *Your Future in the Foundry*, a booklet originated by the Northwestern Pennsylvania Chapter, were printed and distributed to Cleveland schools, libraries, and foundry personnel.

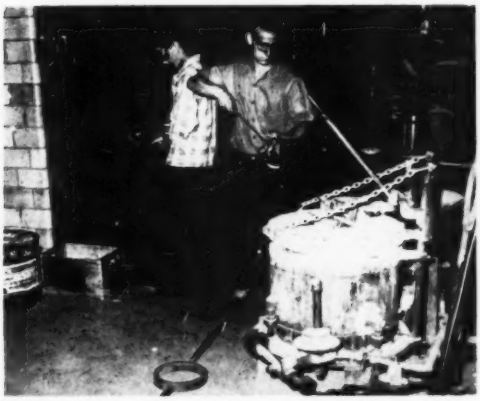
The Northeastern Ohio Chapter's Educational Committee is preparing a series of panels depicting foundry practices and products. These panels, covering aluminum, brass and bronze, gray iron, malleable and, steel casting, will be photographed for a folder to be distributed to schools and civic groups.

A feature of the Northeastern Ohio Chapter's Educational programs for the past 14 years has been its Cleveland District Apprentice Contest, co-sponsored

by the Pattern Manufacturers and Foundry groups of the Associated Industries of Cleveland. The Chapter has stimulated interest in the contest, handled the details and has been host to the winners at an annual prize presentation dinner. Winners' entries are subsequently judged in the national competition held annually by the Society.

The Northeastern Ohio Chapter Educational Committee for 1949-50 is composed of Thomas D. West, West Steel Casting Co., Cleveland, chairman; Carl H. Morken, C. H. Morken & Associates, Cleveland; Frank C. Cech and Anthony S. Sutowski of the Cleveland Trade School; and John H. Tressler, Hickman, Williams & Co., Inc.

Central Indiana Chapter has been especially active during the past year in arranging plant visitations for



Lane students learn foundry fundamentals by using a number of basic casting production techniques.

vocational students of Indianapolis schools. These visitations to gray iron, steel, malleable, and nonferrous foundries included transportation between school and foundry, an orientation talk, and guides. One group was made up of high school instructors in subjects other than vocational. These educators evidenced unusual interest in the workings of a foundry.

Last year saw the first Purdue Regional Foundry Conference, sponsored jointly by the Central Indiana Chapter, the Purdue College of Engineering, and the A.F.S. Michiana Chapter.

The Purdue Regional Conference will again be held this year, November 3-4. Paul Harlan, Electric Steel Castings Co., Indianapolis, will represent the Central Indiana Chapter on the Purdue Regional Conference Planning Committee.

Carl Schopp of the Link Belt Co., Indianapolis, will head the Chapter's Educational Committee for 1949-50. Tentative plans for the season include broadening of plant visitations to include foundries in such Central Indiana cities as Columbus, Kokomo, Marion and Richmond.

A panel of lectures is another probable activity of the Educational Committee. This will consist of several lectures on foundry subjects to be offered to educational institutions upon request and with the cooperation of school faculities.

Another new activity may possibly be undertaken by the Central Indiana Chapter this year—establishment of extension courses for foundry supervisory personnel at Purdue University.

The A.F.S. Ontario Chapter has three major projects in the educational field scheduled for 1949-50:

(1) Renewal of molding classes and lecture courses one night a week at the F. R. Close Vocational School, Hamilton, Ont. The lecture course, taught by Willard Jones, Canadian Westinghouse Co., Ltd., consists of 24 talks in all— on sand control, metallurgy, melting, patterns and designs, molding and gating and risering—and is primarily directed at students on the vocational school level.

(2) Continuance and expansion of a library of 14 foundry practice sound films, available to foundries, schools and civic groups of Ontario. These films are rented out at a very nominal charge.

(3) Establishment of a two-year foundry course at the Western Technical School, Toronto, in collaboration with the Ontario Department of Education. A. Pirrie of the Gurney Foundry Co. will act as liaison between the faculty and the Chapter's Educational Committee. This course will include practical instruction in such subjects as molding, foundry safety practices, coremaking, patternmaking, and use of foundry equipment. Field trips to area foundries will be a feature of the course.

Under the chairmanship of R. H. Williams, Canadian Westinghouse Co., Ltd., the Ontario Chapter's Educational Committee consists of A. Pirrie, Gurney Foundry Co.; A. Reyburn, Massey Harris Co., Ltd.; R. T. Robertson, International Harvester Co., Ltd.; F. Diana of Z. Wagman & Sons; H. H. Fairfield, Wm. Kennedy & Sons, Ltd.; and Willard Jones and T. Hewitt of Canadian Westinghouse Co., Ltd.

The A.F.S. Northern Illinois-Southern Wisconsin Chapter Board of Directors recently voted to award a paid-up A.F.S. membership to a key vocational training teacher in each of the three principal cities in the Chapter area—memberships to be awarded in successive years to instructors from (1) Beloit, Wis. (2) Rockford, Ill., and (3) Freeport, Ill.

The Northern Illinois-Southern Wisconsin Chapter is tentatively planning to conduct a Chapter Apprentice Contest this year in preparation for the A.F.S. Apprentice Contest.

Present A.F.S. Memberships to Educators

The A.F.S. Chicago Chapter this year held a luncheon meeting at Chicago's Lane Technical High School and presented A.F.S. memberships to Howard W. Smith, supervisor of Forge, Foundry and Welding, Chicago Board of Education; and Instructors Thomas H. Brown, Fred H. Dix, Charles E. Roland and L. L. Sutherland. The luncheon meeting and presentation of memberships were the offshoot of an effort on the part of the Chapter's Educational Committee to insure closer collaboration between high school faculty and industry in furthering foundry education.

This year, the Committee hopes to establish a Junior Foundrymen's Society Chapter in every Chicago high school offering foundry courses. Subject to

the approval of its Board of Directors, the Chapter will offer a prize for the best paper on foundry practice submitted by a Chicago high school student, and competition between Chicago high schools and those of other cities in the writing of these papers will be encouraged.

Headed by Roy W. Schroeder of the University of Illinois, Navy Pier Branch, the Chicago Chapter Educational Committee consists of E. E. Schwantes, International Harvester Co.; W. J. Hebard, Continental Foundry & Machine Co.; C. V. Nass, Pettibone Mulliken Corp., Beardsley & Piper Division; F. B. Skeates, Link Belt Co.; F. F. Shoemaker, Armour Research Foundation; A. W. Gregg, Whiting Corp.; W. D. McMillan, International Harvester Co.; and Deming Lucas, Frederic B. Stevens, Inc.

Sponsors Basic Foundry Course

The A.F.S. British Columbia Chapter last year for the second time sponsored a course on basic principles of foundry techniques, comprising 11 lectures and 11 demonstrations. Held at the Experimental Foundry of the Vancouver Technical School, the course covered such subjects as metal shrinkage, machine molding, coremaking and casting defects and their causes. Lectures were attended by Chapter members, apprentices and others interested in the foundry, and were taught by A.F.S. members prominent in various phases of foundry work. A nominal charge of $5 to members and $10 to non-members was made for the entire series.

Similarly, the A.F.S. Philadelphia Chapter last year sponsored a 20-week foundry course "open to all ambitious men in the foundry industry who wish to broaden their knowledge of foundry practice." The course, held at the Murrell-Dobbins Vocational Technical School, Philadelphia, covered virtually all phases of the foundry industry, and featured lectures by nationally-known speakers on foundry techniques from all over the country.

Wisconsin Foundry Exhibit Acclaimed

An example of the way in which a chapter can acquaint and interest the public in the foundry industry, its problems and its place in the national economy was the work of the A.F.S. Wisconsin Chapter in sponsoring and maintaining an extensive foundry exhibit at the Wisconsin Centennial Exposition in West Allis last year. Thousands of persons witnessed a working demonstration of the art of casting metals and viewed exhibits of products made by the foundry for use in Wisconsin-manufactured machines and equipment. The foundry exhibit was considered by many to be the outstanding exhibit in the Centennial Exposition's Industrial Hall.

The project was repeated at the 1949 Wisconsin State Fair. Instead of an operating exhibit, manufactured products illustrating the wide-spread and diversified uses of castings were shown. Emphasis was again laid on the place of the foundry in the country's economy.

The foregoing are the special projects created by individual A.F.S. chapters to further education and interest in the foundry industry, but there are in addition such long term educational activities sponsored by chapters as local apprentice contests and assistance to the A.F.S. student chapters.

Seven local chapter apprentice contests were held in conjunction with the 1949 A.F.S. National Apprentice Contest—Northern California, St. Louis District, Washington, Wisconsin, Detroit, Northeastern Ohio and Eastern Canada—and it is anticipated that several additional chapters will hold local contests in preparation for the 1950 Contest.

Chapters who have A.F.S. student chapters located in their areas have been active in fostering interest in the foundry industry among the students. Their assistance to the student chapters has been in the form of acting in an advisory capacity, raising funds for equipment, providing plant visitations and securing employment for students.

Chapters active in this respect are the St. Louis District Chapter, working with the Missouri School of Mines and Metallurgy; the Twin City Chapter, working with the University of Minnesota; the Oregon Chapter, working with Oregon State College; Central Illinois Chapter, working with the University of Illinois, Urbana; the Central Ohio Chapter, working with Ohio State University; and the Texas Chapter, working with Texas A & M College. While there is no A.F.S. Chapter in the immediate area of the student chapter at the Massachusetts Institute of Technology, company and personal members of the American Foundrymen's Society in nearby areas have been active in assisting the MIT Student Chapter.

Chicago's Crerar Library Announces New Research Service For Industry

INDUSTRIAL RESEARCH FACILITIES are now available to foundries, foundry equipment manufacturers and other firms in the metals field from the John Crerar Library of Science, Chicago, the nation's largest technical library, at a charge covering only the actual cost of the service.

A special staff of research consultants, each of them with a Ph.D. or its equivalent, will undertake to do literature searches of Crerar Library's 700,000 books and/or the 150,000 technical journals and publications it receives regularly, on any given subject. Included in this service are translations in any of the world's major languages, and the furnishing of abstracts, translations and full reports on any subject requested.

Other facilities offered by Crerar's Research Information Service are desks, typewriters and dictaphones for those organizations desiring to send their own researchers to the library. The service will also make a literature search for the researcher and have all material ready for his study. The cost of either service is based upon the time and labor involved, plus a small percentage to cover overhead and supplies.

In some industries, five or six small companies have banded together to purchase a month-to-month investigation of literature in their field. Research Information Service also provides microfilm and photostat service. Details on Crerar's research services for industry are available by writing Kenneth H. Fagerhaugh, Research Librarian, The John Crerar Library, 86 East Randolph St., Chicago 1, Ill.

LAY 1950 CONVENTION PLANS

Pick Technical Papers, Make Early Exhibit Arrangements

APPRENTICE CONTEST OPEN SEPTEMBER 15

WITH PLANS FOR TECHNICAL SESSIONS under way as early as last May, papers and discussion topics of some A.F.S. divisions and committees have already been selected for the 54th A.F.S. Foundry Congress and Show to be held in Cleveland, May 8-12, 1950.

Even before the upward trend in business recently noted occurred, far-seeing exhibitors had visited the Auditorium to select locations most suited to their equipment. Cooperative arrangements have been made by several manufacturers to carry out a complete foundry operation. Speeding plans for the coming Show, the A.F.S. Exhibits Committee met July 15 in Cleveland and August 12 in Chicago to discuss rules and regulations for the 1950 Exhibit.

Program and Papers Committees of the various divisions and the various general interest committees have been planning for the 1950 Convention of the Society since a round of summer meetings was started at the last Convention. A number of papers are already in the hands of committees. Authors wishing to offer technical papers for the 1950 Annual Convention and Foundry Show should submit them to S. C. Massari, Technical Director, American Foundrymen's Society, 222 West Adams St., Chicago 6, Ill., not later than December 15 for transmittal to committees.

On schedule for the Gray Iron Division are a Round Table Luncheon (new last year) a symposium on the production of nodular graphite cast iron to be sponsored jointly with the Malleable Division, three Shop Course sessions and several technical meetings.

Sponsored jointly by A.F.S. and the American Society for Testing Materials will be a symposium on centrifugal casting. Topic will relate to the properties of centrifugally cast metals.

Tentative plans of the Time Study and Methods Committee call for a session on development of bench coremaking standards and a joint meeting with the Cost Committee for the presentation of papers showing the coordination between standards and cost departments for maximum service to management. Refractories Committee sessions are expected to be expanded in 1950 to provide meetings of specific interest to the several branches of the foundry industry.

Malleable Division plans announced to date include a paper sponsored by the Controlled Atmosphere Annealing Committee to be prepared by three authors. These men, who have different types of annealing equipment in their plants, are planning to compile comprehensive information on the effects of atmospheres on malleable iron castings in various furnaces.

Cleaning room equipment will be discussed at the Convention session sponsored by the Plant and Plant Equipment Committee. Recommendations of the Educational Division are that at least two sessions should be held at next year's Foundry Congress and Show. These should relate to (1) the college level, and (2) the trade and high school level and/or training within industry.

Oldest educational activity of the Society—apprentice training and the Annual Apprentice Contest—will reach a climax at the 1950 Convention when first place winners in the 27th Contest receive their prizes from National President E. W. Horlebein at the Annual Meeting.

Open September 15, the Contest will go on until judging early in April with chapters and plants conducting local contest to select entries for the final competition. Lone contestants will be entered by their firms directly in the final judging.

Prizes awarded in each division of the Contest are $100, $50, and $25. All winners receive certificates of recognition and first place winners have round trip rail and Pullman fare provided by A.F.S. so they can attend the Convention.

A fifth Contest division—Metal Patternmaking—has been added this year to the four which have been standard for some time—Gray Iron Molding, Steel Molding, Non-Ferrous Molding, and Wood Patternmaking. Any apprentice is eligible to enter the competition provided he is taking a regular training course of not less than three years duration and is not over 24 years old on the day he makes his pattern or mold. For veterans the age limit is 24 plus their length of service in the armed forces.

Patterns for the molding divisions and blueprints for wood patternmaking are supplied through A.F.S. Headquarters. For metal patternmaking, blueprint and rough aluminum castings will be supplied. Regulations and additional information on the 1950 A.F.S. Apprentice Contest can be obtained from Jos. E. Foster, Technical Assistant, American Foundrymen's Society, 222 West Adams St., Chicago 6, Ill.

Willard E. Kidwell, Packard Motor Car Co., (left), presenting Robert Wunsche, City Pattern Foundry and Machine Co., with the first prize certificate for making the best pattern in the Detroit Chapter's 1949 Patternmaking Contest. The competition was one of seven conducted by chapters in the 1949 Contest.

SOCIETY OFFICERS, DIRECTORS HOLD ANNUAL BOARD MEETINGS

FIRST MEETING of the 1949-50 officers and directors of the American Foundrymen's Society was held July 29 at the Palmer House, Chicago. President E. W. Horlebein, Gibson & Kirk Co., Baltimore, presided. The meeting followed the Annual Meeting of last year's Board July 28 under the chairmanship of W. B. Wallis, Pittsburgh Lectromelt Furnace Corp., Pittsburgh, who was President during the fiscal year just ended.

Budget for the fiscal year 1949-50 was reviewed and approved, recommendations of the 1948-49 Board were studied and acted on, research funds for 1949-50 were authorized, Publications Committee recommendations were received, and a resolution commending the Foundry Educational Foundation was passed.

Attending the two-day series of meetings along with President Horlebein, Past President Wallis, and Vice-President W. L. Woody, National Malleable & Steel Castings Co., Cleveland, were the following National Directors of the Society:

B. L. Simpson, National Engineering Co., and S. C. Wasson, National Malleable & Steel Castings Co., both Chicago—terms expired 1949.

E. N. Delahunt, Warden King, Ltd., Montreal, Que., Canada; W. J. MacNeill, Dayton Malleable Iron Co., Dayton, Ohio; F. C. Riecks, Ford Motor Co., Dearborn, Mich; and John M. Robb, Jr., Hickman, Williams & Co., Philadelphia—terms expire 1950.

T. H. Benners, Jr., T. H. Benners & Co., Birmingham, Ala.; N. J. Dunbeck, Eastern Clay Products, Inc., Jackson, Ohio; A. M. Fulton, Northern Malleable Iron Co., St. Paul, Minn.; Robert Gregg, Reliance Regulator Corp., Alhambra Calif.; and V. E. Zang, Unitcast Corp., Toledo, Ohio—terms expire 1951.

T. E. Eagan, Cooper-Bessemer Corp., Grove City, Pa.; L. C. Farquhar, Sr., American Steel Foundries, East St. Louis, Ill.; V. J. Sedlon, Master Pattern Co., Cleveland; F. G. Sefing, International Nickel Co., New York; and L. D. Wright, U. S. Radiator Co., Geneva, N. Y.—terms expire 1952.

Not present were: Director and Past President Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va., and Director H. A. Deane, American Brake Shoe Co., New York (term expired 1949); and Director A. C. Ziebell, Universal Foundry Co., Oshkosh, Wis. (term expires 1950).

The old Board heard reports of officers and committees, of Secretary-Treasurer Wm. W. Maloney and Technical Director S. C. Massari, and reviewed past year's activities. Attending the meeting as observers were the Directors elected this year. In addition to making recommendations to the new Board, the retiring Board passed resolutions on the death of Director Harry G. Lamker (June 17, 1949) and Director J. E. Kolb (July 22, 1949). The resolutions were made part of the permanent records of the Society and transmitted to the late Directors' families and to their business associates.

The new Board held a special meeting to name an Executive Committee for 1949-50. Elected—in addition to President Horlebein and Vice-President Woody—are: Past President Wallis, and Directors Riecks, Robb, and Zang.

Wm. W. Maloney, who has held the office since 1945, was unanimously re-elected Secretary-Treasurer.

The Executive Committee met July 28, on adjournment of the special Board meeting, to appoint a Nominating Committee.

At its first full-length meeting July 29, the 1949-50 Board of Directors considered in detail the budget recommended by the Finance Committee and reviewed the financial status of the Society. The budget was approved with minor changes. Recommendations of the Publications Committee were studied, action including approval to publish seven books during the coming year.

A.F.S. President E. W. Horlebein, *on the Board of Directors since 1945, was Vice-President last year. For years he was on the A.F.S. Brass and Bronze Division Executive Committee. President of Gibson & Kirk Co., Baltimore (his home town), since 1924, he started work at 18 as apprentice machinist for the Baltimore & Ohio.*

Appropriations for the continuation of A.F.S.-sponsored research projects were authorized assuring the foundry industry of a continuity of work in the study of foundry fundamentals.

Following a discussion of educational activities, the Board passed the following resolution and instructed that it be transmitted to the Trustees of the Foundry Educational Foundation:

> *Resolved*, That the American Foundrymen's Society extends to the Trustees and Staff of the Foundry Educational Foundation its sincere compliments on the progress and accomplishments of the Foundation since its establishment, and at the same time respectfully requests that the Trustees of the Foundation feel free to advise the American Foundrymen's Society what further cooperation the Society may render in extending the work of the Foundation for the future.

Named second A.F.S. delegate to the 1949 International Foundry Congress, Amsterdam, Netherlands, August 28-September 2, was A. W. Gregg, Whiting Corp., Harvey, Ill. Other delegate is A.F.S. European Representative Vincent Delport, London, England.

REGIONAL FOUNDRY CONFERENCE PROGRAMS STRESS NODULAR GRAPHITE CAST IRON

NODULAR GRAPHITE CAST IRON as a discussion subject outnumbers any other single topic on regional foundry conference programs of the coming year. Opening the 1949-50 series of regionals are the Sherbrooke Meeting of the Eastern Canada Chapter, September 30-October 1, and the New England Regional Foundry Conference, October 7 and 8. Final plans for these meetings have been announced and preliminary arrangements for the other seven regional foundry conferences scheduled to date are well under way.

Other conferences scheduled are:

Metropolitan Regional Foundry Conference, sponsored by the Metropolitan, Philadelphia, and Chesapeake Chapters, Stevens Institute of Technology, Hoboken, N. J. October 21-22.

Michigan Regional Foundry Conference, sponsored by the Central Michigan, Western Michigan, Saginaw Valley, and Detroit Chapters, Michigan State College, East Lansing, Mich., October 28-29.

Purdue Regional Foundry Conference, to be held at Purdue University, Lafayette, Ind., November 3 and 4 under the sponsorship of the University, and the Central Indiana and Michiana Chapters.

New York State Regional Foundry Conference, sponsored by the Western New York, Eastern New York, Rochester, and Central New York Chapters in cooperation with Syracuse University, November 25 and 26, at Syracuse University and the Onondaga Hotel, Syracuse, N. Y.

Ohio Regional Foundry Conference, sponsored by the Cincinnati District, Northeastern Ohio, Canton District, Central Ohio, and Toledo Chapters, March 10 and 11, 1950, Netherland Plaza Hotel, Cincinnati.

Dates of the Wisconsin and of the Birmingham Regional Foundry Conferences, customarily held in February, have not been announced. These conferences are held, respectively, in Milwaukee and in Birmingham, Ala., and are sponsored by the Wisconsin Chapter and the Birmingham District Chapter.

NEW ENGLAND REGIONAL CONFERENCE

Plans for the 9th New England Regional Foundry Conference detailed by Conference Chairman A. F. Dockry, H & B American Machine Co., Pawtucket, R. I., include two days of technical meetings, a conference, dinner, and a dinner-smoker. To be held at Massachusetts Institute of Technology, Cambridge, October 7 and 8, the conference is sponsored by the New England Foundrymen's Association, Massachusetts Institute of Technology, MIT Student Chapter of A.F.S., Boston Chapter of Non-Ferrous Founders' Society, Connecticut Non-Ferrous Foundrymen's Association, Connecticut Foundrymen's Association, and other engineering and metals organizations.

Friday, October 7

9:00 a.m.—REGISTRATION. Lobby of Building 10.
9:30 a.m.—OPENING SESSION. Welcoming address by Thomas K. Sherwood, MIT dean of engineering.
9:45 a.m.—"*Gates and Risers*," Fred G. Sefing, International Nickel Co., New York.
12:15 p.m.—LUNCHEON. Walker Memorial.
2:00 p.m.—LUMEN S. BROWN LECTURE. "*Public Relations and the Foundry Industry*," Frank G. Steinebach, Penton Publishing Co., Cleveland.
3:00 p.m.—"*Core and Core Sand Additives*," J. A. Gitzen, Delta Oil Products Co., Milwaukee.
6:00 p.m.—CONFERENCE DINNER. Graduate House.
Speakers: Dr. John Wulff, mechanical metallurgy department, MIT. Walter G. Strathern, Eastern Gas & Fuel Association, Boston—"*Standing Still—or Going Ahead*."

Saturday, October 8

8:30 a.m.—REGISTRATION. Lobby, Building 10.
9:00 a.m.—"*Sand—Maine to California*," Clyde A. Sanders, American Colloid Co., Chicago.
10:30 a.m.—"*Foremen—Leaders or Drivers*," Sherman Rogers, Sherman Rogers Publications, Chicago.
12:00 noon—LUNCHEON. Walker Memorial.
1:30 p.m.—SECTIONAL MEETINGS.
Gray Iron—"*Cupola Practice*," B. P. Mulcahy, Fuel Research Lab. Inc., Indianapolis.
Non-Ferrous—Round Table Discussion. "*Making Bronze Pressure Castings*," James O'Keeffe, Jr., MIT.
3:00 p.m.—"*Latest Developments in Nodular Iron*," C. O. Burgess, Gray Iron Founders' Society, Cleveland.

A dinner and smoker, sponsored by local representatives of foundry supply companies, is scheduled for the evening of October 8 following the closing of the conference.

Conference Arrangements Committee members, in addition to Mr. Dockry, are: F. Fitzgerald, Draper Corp., Hopedale, Mass., vice-chairman; H. Stenberg, Draper Corp., program chairman; W. M. Saunders, Providence, R. I., publicity chairman; Clyde W. Armstrong, Warren Pipe Co. of Mass., Everett, Mass.; T. I. Curtin, Waltham Foundry Co., Waltham, Mass.; J. Crotty, Crompton & Knowles Loom Works, Worcester, Mass.; F. R. Elliott, Westinghouse Electric Corp., Springfield, Mass.; and Thomas Healey, Seaboard Foundry, Johnston, R. I.

Others are: R. F. Meader, Whitin Machine Works, Whitinsville, Mass.; G. Paul, Brown & Sharpe Mfg. Co., Providence; E. Stockwell, Barbour Stockwell Co.,

Lynn, Mass.; D. F. Sawtelle, Malleable Iron Fittings Co., Branford, Conn.; H. Spencer, Jr., Philbrick, Booth & Spencer, Hartford, Conn.; Prof. Howard F. Taylor, MIT; Cambridge, Mass.; J. Stazinski, General Electric Co., L. Tarantino, Niagara Falls Smelting & Refining Co., New Haven, Conn.; S. Tims, Saco-Lowell Shops, Biddeford, Maine; A. S. Wright, Standard Foundry Co., Worcester; and R. Walker, Whitin Machine Works.

The Registration and Reception Committee, consisting of local representatives of foundry supply companies, is headed by C. A. Wyatt, Debevoise-Anderson Co., Boston; Treasurer is Frank Kumer, Springfield Facing Co., Springfield, Mass.

NEW YORK STATE REGIONAL

Tentative program for the New York State Regional Foundry Conference has been announced by Program Chairman L. D. Wright, U. S. Radiator Co., Geneva, N. Y. To be held November 25 and 26 at the Engineering and Science Campus of Syracuse University, Thompson Road, Syracuse, N. Y., the conference includes a number of technical sessions and laboratory visitations. Nodular iron and gray iron specimens will be tested in a demonstration of physical testing during a laboratory visitation preceding formal opening of the conference.

First technical session, the morning of November 25, will deal with nodular graphite cast iron. Sectional meetings in the early afternoon will cover malleable iron, gray iron, non-ferrous, and steel topics. Late afternoon will be devoted to motion and time study with emphasis on elimination of fatigue and unnecessary work caused by waste motions.

Sand will be the subject of discussion the morning of November 26 with Harry W. Dietert, Harry W. Dietert Co., Detroit, as speaker. Laboratory visitations are being arranged for the late morning and early afternoon by Prof. F. R. Morrel and E. Syrene of Syracuse University.

Luncheons are planned for both days of the New York State Regional Foundry Conference; a conference dinner is scheduled for the evening of the first day at the Onondaga Hotel, Syracuse.

In addition to Program Chairman Wright, conference officials include: E. E. Hook, Dayton Oil Co., Syracuse, general chairman; J. F. Livingston, Crouse-Hinds Co., Syracuse, secretary; and John A. Feola, Crouse-Hinds Co., publicity.

SHERBROOKE MEETING

The Sherbrooke Meeting, scheduled in response to a questionnaire circulated by the Eastern Canada Chapter, will be held September 30-October 1 at the New Sherbrooke Hotel, Sherbrooke, Que., Canada. The two-day meeting combines technical sessions and plant visitations with an afternoon of sport following the pattern set two years ago at the Sherbrooke Regional. The Ontario and Eastern Canada Chapters have decided not to continue the full-scale regional meetings started in 1947 at Sherbrooke and continued in 1948 in Montreal. Canadian Regional Foundry Conferences will be held every two years, the next being set for Hamilton, Ont., in 1950.

A. J. Moore, Montreal Bronze Ltd., Montreal, Que., chairman of the Sherbrooke Meeting Committee, announces the following program:

Friday, September 30

10:30 a.m.—REGISTRATION. New Sherbrooke Hotel.
12:30 p.m.—LUNCHEON.
2:00 p.m.—PLANT VISITATIONS.
5:30 p.m.—ENTERTAINMENT.
6:15 p.m.—DINNER.
8:00 p.m.—*"Gates and Risers."* Separate papers on steel, gray iron, and bronze. Discussion.

Saturday, October 1

10:30 a.m.—*"A Patternmaker in the Foundry."* Several leading patternmakers of the area will open the meeting with short papers. Discussion.
12:00 noon—BUFFET LUNCHEON.
2:00 p.m.—OUTING. Golf, horse shoes, and other sports.

Planning the meeting along with Chairman Moore, are M. A. Hughes, LaSalle Coke Co., vice-chairman of the committee, James H. Newman, Newman Foundry Supply Ltd., advisor, and the following: C. H. Atkinson, George F. Pettinos (Can.) Ltd.; Claude Bourassa, Werner G. Smith Ltd.; W. C. Rowe, Crane Ltd.; and L. Guilmette, Canadian Foundry Supplies & Equip. Ltd. All from Montreal, the committee members are being assisted by Chapter Members: William J. Brown, Robert W. Bartram Ltd.; H. E. Francis, Jenkins Bros. Ltd.; Lucien Beaudry, Warden King Ltd.; and M. E. Fee, Canada Starch Sales Co.

Working on arrangements for the two-day meeting are the following Sherbrooke-area foundrymen: G. W. Young and Dudley Coates, Canadian Ingersoll-Rand Ltd.; C. E. Basset and E. Fisette, Canadian Fairbanks-Morse Ltd.; H. R. Neville, Manganese Steel Castings Ltd.; E. Patton, Unicast Corp.; and Willrid Legare, La Fonderie Legare.

MICHIGAN REGIONAL CONFERENCE

General theme of the Michigan Regional Foundry Conference is *"New Developments in the Foundry Industry"* according to Prof. C. C. Sigerloos, mechanical engineering department, Michigan State College. On the opening day, October 28, the keynote address on this subject will be delivered by L. A. Danse, General Motors Corp., Detroit. *"Mechanizing for Small Jobs"* is the topic of a paper to be presented by Frank W. Shipley, Caterpillar Tractor Co., Peoria, Ill. A general discussion of mechanization is to be given by Walter Gerlinger, Walter Gerlinger, Inc., Milwaukee. Walter Hummel, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., will complete the morning's program with a discussion of cost reduction.

Nodular cast iron and stress analysis of castings are the general topics planned for the afternoon.

The morning of October 29 three topics will be covered. Prof. Howard Womochel, mechanical engineering department, Michigan State College, will present a report on foundry research. Harold S. Austin and Walter F. Bohm, Buick Motor Div. of GMC, Flint, Mich., and Clyde A. Sanders, American Colloid Co., Chicago, will discuss *"Effect of Mold Materials on Shrinkage."* Concluding paper will be *"Practical and Social Aspects of Cupola Smoke Control"* by William Witheridge, General Motors Corp.

FEF TO ADD FIVE UNIVERSITIES

Seeks To Raise $400,000 For Newly-Expanded Three Year Program

FIVE MORE UNIVERSITIES will be added to its group of scholarship engineering schools, the Foundry Educational Foundation announces, if its fall campaign to raise $400,000 for an expanded program is successful. The campaign will get under way in October.

The FEF's campaign to raise funds for its next three-year cycle will feature meetings to be held in 20 foundry centers, affording foundrymen throughout the country an opportunity to hear first-hand about the Foundation, its aims, and principles.

Stowell C. Wasson, National Malleable & Steel Castings Co., Cleveland, Foundation president, has appointed Homer F. Tielke, Crucible Steel Castings Co., Cleveland, chairman of the campaign to raise funds for the new three-year program.

The following have been asked to serve as chairmen of the respective divisions of the foundry industry for the campaign:

Past FEF President Anthony Haswell, Dayton Malleable Iron Co., Dayton, Ohio, representing the Malleable Founders' Society.

F. Kermit Donaldson and Thomas H. Shartle, representing the Steel Founders' Society of America.

John M. Price and Frank O'Malley, both of Ferro Machine & Foundry Co., Cleveland, representing the Gray Iron Founders' Society.

William A. Gluntz, Gluntz Brass & Aluminum Foundry Co., Cleveland, representing the Non-Ferrous Founders' Society.

Claude B. Schneible, Claude B. Schneible Co., Detroit, and Arthur J. Tuscany, representing the Foundry Equipment Manufacturers' Association.

L. P. Robinson and Warner B. Bishop, Werner G. Smith Co., Cleveland, representing the Foundry Supply Manufacturers' Association.

In line with its proposed program of expansion for its second three-year cycle, the Foundry Educational Foundation recently moved its headquarters to 1008 Terminal Tower, 50 Public Square, Cleveland.

The college level program of the FEF is moving toward its objective of 300 engineering graduates a year for the foundry industry by 1958. To date, 148 scholarship units of one year each have been awarded to 102 students at six colleges.

Aside from Foundation scholarships, cooperating colleges now have a growing investment in equipment, personnel and buildings utilized in the foundry educational program—an indication of increasing confidence in the aims and policies of FEF.

FEF is becoming increasingly active in providing contacts between engineering graduates and students and castings industry executives. Optional courses offered at FEF's seven cooperating colleges are exercising a favorable influence on many engineering students, judging by an increasing number of applications which indicate that the foundry industry is actively competing with other industries for the pick of engineering students.

With A.F.S. Student Chapters in seven colleges—three of which are in Foundation schools—and more contemplated, with the A.F.S. program in high schools, and with the FEF's activities at college level, the foundry industry is assured of filling personnel gaps at all operating levels in the future.

Pictured here is the Foundry Educational Foundation's campaign organization committee for the Foundation's effort to secure $400,000 for its three-year expanded program. Seated, left to right, are: Anthony Haswell, Dayton Malleable Iron Co., Dayton, Ohio; Claude B. Schneible of the Claude B. Schneible Co., Detroit; F. Kermit Donaldson, Steel Founders' Society of America; Chairman Homer F. Tielke, Crucible Steel Casting Co., Cleveland; L. P. Robinson, Werner G. Smith Co., Cleveland; and John M. Price, Ferro Machine & Foundry Co., Cleveland. Standing, left to right: George K. Dreher, Foundry Educational Foundation; Arthur J. Tuscany, Foundry Equipment Manufacturers' Association; Raymond L. Collier, Gray Iron Founders' Society; and Frank O'Malley of the Ferro Machine & Foundry Co., Cleveland, Ohio.

"Bottom-Up" MANAGEMENT

William B. Given, Jr.
President
American Brake Shoe Co.
New York

Until recent years emphasis was placed on the techniques of management. Lately businessmen have come to realize that the success and progress of an enterprise is the sum-total of the success and progress of its people. The management which fails to stimulate their wholehearted interest and loyalty, and fully utilize their ideas and initiative—as well as their time and energy and skill—is short-changing itself, its stockholders, and the public it serves.

There are in modern business two extremes of management philosophy and practice. One is dictatorial or from-the-top-down management, the other management from-the-bottom-up.

Under "top-down" management the head of the business does practically all the thinking and planning and issues orders to those under him. In the extreme form it is management under which boss decisions are seldom questioned. Nor are ideas or suggestions sincerely solicited from the organization. The current of initiative flows down from the top. In short, the chief executive runs the business. Whether he realizes it or not, he demands blind obedience. As a rule, the same situation exists in the various divisions or departments of the business, with their respective executives dominating them even as they are dominated, since the head of the business is likely to choose as his lieutenants men of like attitude.

"Bottom-Up" Management Defined

Under "bottom-up" management the head of a business tries to release the thinking and encourage the initiative of all those down the line, so that ideas and impetus flow from the bottom up, and the entire organization contributes in the fullest possible measure to the progress and profits of the enterprise. Ideas for the improvement of the company's products or service, ideas for advertising or sales promotion; ideas for effecting savings in time, money, motions or materials; ideas for research or development programs, ideas for bettering working conditions—in short, ideas for making a better and more prosperous company—flow up from below.

The chief executive makes clear the objectives, charts the course and holds the organization to it. Naturally, he makes many suggestions, but he seldom gives orders. Following this policy he adds to his own ability, the ability and initiative of hundreds or thousands of others.

It is his responsibility to see that the heads of all divisions and departments are encouraged to follow a similar policy at their respective levels—or, if necessary, are even instructed to follow it, for this is one point on which the chief executive is justified in exerting authority. In this way each division or department becomes a team, and the head of each is a leader or captain who multiplies his own effectiveness and value by the number of people under him whom he develops to think and act for themselves.

The captain is expected to stimulate and release ideas from those below him and, in turn, to pass them on up if they seem to be of value, so that each worker will be as useful to the business as possible. Like the captain of an athletic team, he need not be the best player but he must be a leader.

Creates Employee Initiative

Of necessity, the most that top management can expect to do is to create a sense of independence and freedom of initiative down through the middle-management levels. But if that is done successfully, the feeling spreads, and the least important workers eventually share in it.

Most business managements function in the broad zone between these two extremes, some inclining more toward the top-down and others more toward the bottom-up school in both spirit and methods. Successful businesses have been built under both philosophies. In this book, however, I propose to explore the possibilities of bottom-up management and discuss certain aspects of business administration which seem relevant to it, without condemning the opposite type of management, even by implication.

One of the major characteristics of bottom-up management is, of course, the spreading of responsibility within the organization. This is by no means a new management technique. In the form of decentralization it has been in use for many years. Probably more than any other single factor it accounts for the success of some of the country's large corporations. Indeed, the degree of their success seems often to reflect the degree of their management decentralization.

Yet it is not the usual concept of decentralization that we are considering, namely, merely giving the heads of subsidiaries or divisions more authority, more freedom to manage. We are dealing with decentraliza-

tion carried a step further, with a radically different effect. Call it progressive decentralization, if you will, using progressive in its pathological sense of "spreading from one part to others." Such decentralization not only takes the lead strings off subsidiary presidents and department heads, but also gives officers, superintendents, foremen, chief clerks—people all along the management line—a stimulating feeling of personal freedom; freedom to think and plan boldly; freedom to venture along new and untried paths; freedom to fight back if their ideas or plans are attacked by superiors; freedom to take calculated risks; freedom to fail, in some instances.

Most important is freedom to fail, if only because spiritually it is the hardest to achieve—and, of course, it can never be fully realized. At the same time, freedom to venture and freedom to take calculated risks mean nothing if failure is always punished. It does not matter what form the punishment takes; it can be a raised eyebrow or a sharp tone of voice, as well as dismissal or failure to promote. The man who is encouraged to take risks must know that failure of some idea or plan or project will not draw criticism or derision. Of course, this does not mean that a man can fail consistently and still continue to enjoy management's confidence; that would be impossible. And the risks that are taken must be intelligent risks, carefully thought out and the hazards appraised in advance. But even though he does not have all the odds on his sides, a man must be free to decide and act in a given situation, knowing that failure will not seriously harm him in the eyes of his superiors.

An internationally recognized authority in the field of management techniques, William B. Given, Jr., has been president of one of the world's largest producers of castings—the American Brake Shoe Co.—since 1929. Under his leadership, Brake Shoe has grown to be an organization of 58 plants in the United States and Canada. In this article, Mr. Given encourages management to foster employee initiative from the bottom up.

"Freedom to Fail"

Progressive decentralization, therefore, takes a certain percentage of mistakes for granted and, in review, finds them less frequent and less costly than the results under the czarist type of management. At the same time, because a man is given the freedom to fail, he is more likely to try things "on his own" which, in another type of organization, he would hesitate even to submit to higher authority for approval. Normally he is, or at least should be, in the best position to appraise the chances of success in his own area.

This does not mean that a man is cut off from the help of his superiors' judgment and experience. If advice is needed, he knows where to go for it. He knows also that he will probably end by answering his own questions. In such schooling, people are reminded continually that their growth will be largely based on the degree of their self-education and their acceptance of, and reaching out for guidance from, their supervisors in the organization.

Speaking of Mr. Given's newly-published book, *Bottom-Up Management*, of which the first chapter is reprinted here, Lawrence A. Appley, president of the American Management Association, has said, "Here is the answer to competitive survival in an increasingly complicated economy. It is a management 'way of life' that no executive can afford to leave unstudied and unabsorbed." In this article, Mr. Given outlines the basic tenets of his philosophy of management—fundamentals which in subsequent chapters of the book are developed more fully as a day-to-day guide for industrial management. *Bottom-Up Management*, 171 pages, published by Harper & Bros., New York: covers such phases of management as employee instruction, assignment of responsibilities, value of research, competition for skilled employees, human relations, specifications for management material, industrial health, and the technique of management in industry.

Emphasizes Shared Responsibility

Under a philosophy of delegated, and accepted, individual responsibility, the advice of top management may be heeded just as closely as orders would be under an autocratic setup—perhaps even more so in some instances. Yet the way the advice is given remains the important difference. In our company it is normally given in the form of an exchange of ideas in connection with any problem or situation or any new project. This term itself demonstrates the thoroughness of our attempt to put the emphasis on the feeling of shared responsibility. Every man is encouraged to answer his own questions and formulate his own judgments. He knows that usually he will be permitted to follow his own judgment, if he thinks his own ideas are sound, even against the advice of others; and should it turn out that he was wrong he will not hear, "I told you so!"

In our business many mistakes and failures occur in the realm of decisions about new products. It has for years been company policy to broaden our extensive lines, especially in wear- and heat-resistant metals and materials. Although some of the ideas for new products come from the company's Research Center, more of them are developments representing the constructive interest of individuals at various management levels in the company's separate operating divisions.

To stimulate such contributions to the company's over-all progress, it is necessary to allow and encourage the various divisions to venture into fields where the chance of success may seem small. As a result, hundreds of our people are constantly on the lookout for new-product opportunities. They are anxious to pass on their suggestions to those above or, if they happen

to be in positions of responsibility, to test their ideas on a laboratory scale without obtaining advance approval. Many of these ventures fail, sometimes expensively. A few succeed. But to date the net result has been on the profit side.

Acceptance of the right to fail tends to eliminate the frustation that stifles an organization and turns men into mere cogs with no sense of individuality and no incentive to think or plan beyond the day's work. Men seem to venture with even greater determination to win when the long-odds chance is their own idea and when, in spite of the skepticism of their superiors—and sometimes because of it—they are free to test their own judgment.

In the atmosphere which this freedom to fail produces, men learn quickly to recover their poise and confidence when they make mistakes or suffer disappointment. Under such conditions they do more and better thinking and produce more and better work, since their thinking can be turned into action and their action into accomplishment, without fear of criticism or censure.

STANDARD TEST SAND SELECTED

Robert E. Morey
Metallurgist
Naval Research Laboratory
Washington, D. C.

A STANDARD BASE SAND for the study of various sand properties has long been used by the A.F.S. Sand Division and others. Recently the need for a secondary standard has been recognized and met.

For many years the American Foundrymen's Society has had a Standard Test Sand consisting of rounded sand grains from the St. Peter sandstone deposit at Ottawa, Ill. The grains pass the 50 mesh sieve and are retained on the 70 mesh sieve. Small discrepancies totalling not over five per cent are allowed at either end of the size range. The sand has a nearly constant surface area per unit of weight and the grain shape and surface texture are remarkably uniform.

This standard sand, obtainable from Ottawa Silica Co., Ottawa, Ill., has proved to be very useful for certain purposes such as the study and comparison of the strength of core oils and other sand binders.

The amount of actual foundry investigational work carried on cooperatively by the various sand committees in working meetings or by the members in their individual plants has greatly increased during the past few years. In conducting this work, need has been felt for a sand more nearly comparable to that in actual use in making synthetically bonded sands. For instance, a sand distributed over at least three sieves is desired instead of the uniformly sized grains of the Standard Test Sand. Other requirements are that it be somewhat finer than the present Standard Test Sand and that it be sufficiently low in cost to permit committees with limited budgets to buy enough to make up regular foundry heaps of test sand.

The problem of selecting and specifying a suitable sand was referred to the Grading and Fineness Committee. Two general methods of study were considered: (1) the making up of an arbitrary set of sieve analyses to define the size limits of the desired sand: and (2) the study of existing sands of a suitable size preparatory to defining the desired sieve analysis. The first method was discarded because it was felt that such a specification might be somewhat artificial and require special techniques to produce the sand. This would make the cost prohibitive. Instead, sieve analyses of a number of grades of sand were considered.

One sand was selected as having about the right size and distribution. Sieve analyses made over a period of several years showed that the grade had remained relatively constant. One difficulty encountered was that the sieve analysis varied slightly depending on the kind of sieve shaker used in making the test. Separate specifications were made for each of the two most common types of sieve shaker but this proved too complicated so the tests were limited to one machine.

Statistical methods were used to establish the average cumulative sieve analysis and the allowable limits on each of the sieves. As a result of this work the following specification was proposed:

SECONDARY STANDARD TEST SAND

The sand shall consist of washed and graded subangular sand grains, mined in the Millville district of southern New Jersey. It shall contain at least 98.5 per cent SiO_2 and shall have a sieve analysis within the following limits when tested on a Rotap sieve shaker for 15 minutes using the tapping hammer.

Sieve U.S. Series Equivalent Number	Cumulative Per Cent Minimum	Maximum
20	0	1
30	0	1
40	0	1
50	2	5
70	20	30
100	60	70
140	88	93
200	98	100
270	99	100
Pan	100	100

The New Jersey Silica Sand Co., Millville, N. J., has set aside a stock of sand which appears to satisfy the specifications and which has been approved by the Grading and Fineness Committee. The producers have suggested that the sand be shipped slightly damp to prevent settling of fine particles, in multi-ply paper bag containers.

The Grading and Fineness Committee realizes that the specification is unusual in that it is based on cumulative curves. It may be that the limits are too close to be practical or that the silica content has been set too high for a sand of this fineness.

Comments of users will be appreciated. They may be directed to the writer, who is chairman of the A.F.S. Grading and Fineness Committee, at 107 Seneca Drive, S. E., Washington, D. C., or to the Technical Director, American Foundrymen's Society, 222 West Adams St., Chicago 6, Ill.

MAGNESIUM ADDITIONS *and* DESULPHURIZATION *of* CAST IRONS

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ALTHOUGH THE SUBJECT OF NODULAR CAST IRON and its formation by additions of magnesium to molten cast iron is of widespread interest and of much importance, the literature on the subject is limited, especially with reference to detailed information on the metallurgy involved. As a contribution to this subject, the present paper will discuss some data taken from work in the experimental foundry of the Bureau of Mines at Ottawa.

Addition Losses

When magnesium is added to molten cast iron, some magnesium will be lost by burning or mechanical means; some will be consumed in desulphurization of the iron; and, if sufficient is added, some will remain as a residual amount in the iron. Magnesium can be consumed or rendered inactive in other ways, but in general the foregoing are the principal ones and will be factors whether the magnesium is added as pure metal, as a master alloy, as a mixture, as a reactive mixture, or by other means.

Losses of magnesium by burning on addition vary widely, depending on the type and method of addition, and may be as high as 97 per cent for additions of magnesium metal, or less than 10 per cent for additions of other types.

It should be noted that a low loss by burning is not necessarily the best condition, since to obtain low burning losses expensive addition agents may be necessary or undesirable amounts of other alloying elements may be introduced into the iron. The optimum condition is probably that which produces the nodular form of graphite at the lowest over-all cost per ton of iron treated, combined with the lowest amount of other residual elements or alloy, and this may or may not coincide with the smallest loss by burning.

Study of published data on recoveries of magnesium (the inverse of losses) can be misleading, since most of the figures quoted are without reference to the original sulphur content of the iron. Since some desulphurization apparently always takes place, absence of information on sulphur contents makes it impossible to determine true recoveries.

However, in Table 1 are shown data taken from Donoho, AMERICAN FOUNDRYMAN, Feb., 1949, and from a paper by Holdeman and Stearns given at the Western Metals Congress in Los Angeles in the spring of 1949, and published in the Aug., 1949 issue of AMERICAN FOUNDRYMAN, and from some of the author's unpublished work. These recoveries are the percentage of the added magnesium subsequently found in the iron by analysis, and take no account of that consumed or eliminated by desulphurization.

If these latter amounts were included, then the recovery of added magnesium in desulphurization plus a residual amount would of course be higher. Although data on original sulphur contents are lacking, it is probable that the sulphur content of the irons before additions was of the order 0.02–0.04 per cent.

It is well known that many other addition agents are in use and under development, but data on recoveries, although in some cases known to be higher than any shown in Table 1, are not at present available.

TABLE 1 – MAGNESIUM RECOVERY

Addition Agent	Average Recovery, per cent		
	Donoho	Holdeman & Stearns	Rehder
Cu-Mg, 50-50	12	5-8	10-14
Cu-Mg, 70-30	13	8-15	—
Cu-Mg, 80-20	15	9-15	—
Cu-Mg, 90-10	—	20-25	30-35
Ni-Mg, 50-50	8	5-8	—
Ni-Mg, 82-18	27	25-40	30-35
Ni-Mg, 90-10	—	30-40	—

When magnesium is added as a master alloy, a large proportion of the alloying metal usually also enters the iron. In many cases, large amounts of other alloy are not necessary or desirable, from consideration of both costs and metallurgical effects. With use of master alloys of low magnesium content, large amounts of alloy may enter the melt and, through accumulation in sprue and remelt, may build up to undesirable proportions. This is especially true if iron of higher sulphur content is to be treated, as the larger additions then necessary will further increase the amount of other alloy introduced.

Apart from indicating in a general way which of the master alloys shown provides the best recoveries

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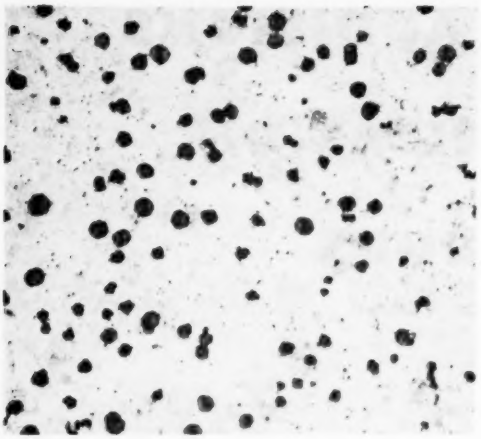


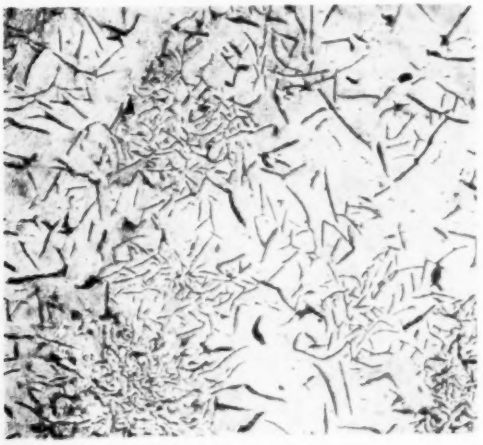
Fig. 1—Nodular graphite iron from 1¼ in. round as-cast bar with 0.034 per cent magnesium content and 0.014 per cent sulphur. Nital etch, 2 per cent. X100.

of magnesium, data such as in Table 1 are of little immediate assistance in determining the amounts of addition necessary in specific instances, because of the large uncertainties involved. This is true principally because of lack of published data on desulphurizing reactions, and further study of these reactions and publication of results is essential to a sound metallurgy.

The data in Table 1 are already out of date and of little commercial interest, although nothing has been published of other results. This is known through informal discussions, as well as from work in these laboratories which indicates methods of doubling or tripling recoveries.

When magnesium is added to molten cast iron, some desulphurization apparently always takes place, even though the original sulphur content be low, and the magnesium consumed as a desulphurizing agent must be taken into account in making additions. The amount of desulphurization depends on, among other factors, the original sulphur content of the iron; the type of addition; the method of addition; and the temperature of the iron on addition. It varies between 50 per cent and 95 per cent, but in general seems to approximate 80 per cent.

Fig. 2—Graphite flake structure of iron 1¼ in. round as-cast bar with 0.033 per cent magnesium and 0.036 per cent sulphur. Nital etch, 2 per cent. X100.



Desulphurizing Reactions

Molten irons of high sulphur content can be treated with magnesium-bearing additions to produce nodular graphite, and iron of 0.16 per cent sulphur content has been successfully treated in the author's work. The question of how much magnesium is consumed in desulphurizing reactions is obviously important, both with respect to control, in determining the total addition required, and to costs, in determining whether it is cheaper to desulphurize the base iron with magnesium or by preliminary treatment with soda ash or other standard technique.

Some measurable amount of sulphur is usually left in the iron after an addition of magnesium, and its amount will depend on several factors. It has been noticed, both in the author's work and in that of others, that the actual amount of sulphur remaining in the iron after the magnesium addition has a major effect on the amount of magnesium residual in the iron necessary to the formation of a completely nodular graphite structure, other factors the same.

For example, in Figs. 1 and 2 are shown two irons with the same magnesium content but with different residual sulphur contents. The irons are of closely similar compositions otherwise, and the sections shown are from bars of the same as-cast size. It is obvious that the iron of lower sulphur content has a satisfactory nodular structure, while the other is completely flake graphite.

It should be noted here that all magnesium contents given in this paper have been determined by a wet chemical method, developed in the chemical laboratory of the Canadian Bureau of Mines, which gives results reproducible to 0.002 per cent magnesium. The sulphur contents are the results of duplicate determinations by the combustion method.

It is believed, lacking absolute proof, that the magnesium sulphide which may be formed has the formula MgS, Assuming that such a sulphide exists, that it does not take part in the nucleation process whereby nodular graphite is formed, and that, when sulphur and magnesium are simultaneously present in solid iron, the sulphur is present entirely as MgS, then it is logical to deduct from the total magnesium present the amount of magnesium tied as MgS in order to find the amount of magnesium present which has taken part in the formation of nodular graphite.

From the formula MgS, it is evident that the amount of magnesium to be deducted is 0.75 times the residual sulphur content, and that nucleating magnesium = Mg_n = total magnesium minus per cent sulphur × 0.75. No inference is made as to how this "nucleating magnesium" operates, although the author believes that it exists as a carbide.

When this calculation is performed for the two irons shown in Figs. 1 and 2, it is found that Mg_n is 0.024 per cent for iron 1 and 0.006 per cent for iron 2. In repeating this work for a large number of heats in which other chemical composition, amount and kind of post-inoculant, and as-cast bar size were constant, it was found that a certain minimum nucleating magnesium content was necessary for a completely nodular structure to be formed.

If the nucleating magnesium content was below this figure, some proportion of nodular graphite below 100 per cent was formed, and if the amount was much above this figure free carbide appeared in light

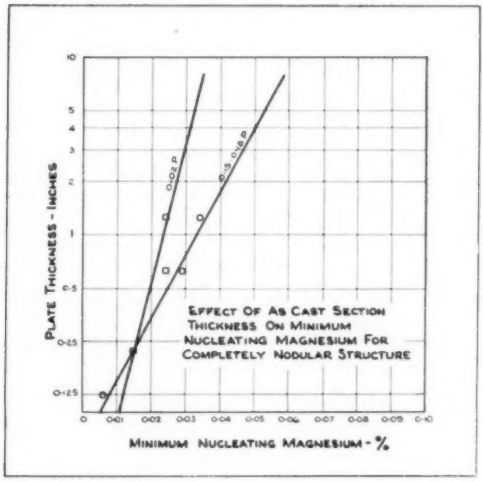


Plate Thickness - Inches
Minimum Nucleating Magnesium - %
Effect Of As Cast Section Thickness On Minimum Nucleating Magnesium For Completely Nodular Structure
0·03 P
0·15 - 0·18 P

Fig. 3—Graph showing effect of as-cast section size on amount of nucleating magnesium necessary to form a completely nodular structure.

sections and then in heavier sections as the amount increased. This minimum amount of nucleating magnesium is apparently independent of actual sulphur content, actual magnesium content and type or method of magnesium addition among those so far tested. It is probably dependent on other chemical composition and on the type and method of post-inoculant, and work in this direction is proceeding.

There is a definite effect of as-cast section size on the minimum amount of nucleating magnesium necessary to form a completely nodular structure, as it is quite possible to obtain an amount such that a bar ½ in. in diameter will be of completely nodular structure, while a bar 1½ in. in diameter will be of almost complete flake structure. Investigation of an extended series of heats with differing amounts of magnesium and sulphur and poured into bars of different thicknesses gave results from which Fig. 3 was drawn.

Irons of two levels of phosphorus content, 0.02 per cent and 0.15 to 0.18 per cent, were used, and apparently section sensitivity is less at lower phosphorus content. It should be mentioned that magne-

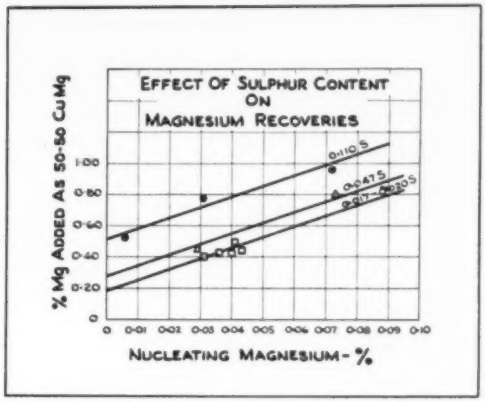


Fig. 4—Effect of sulphur content in cast irons on magnesium recoveries.

sium additions produce a definite dephosphorizing action which is important for higher phosphorus contents and for such irons must be taken into account. Some addition agents are more effective in this respect than others, as much as 70 per cent dephosphorization being possible.

The effect of phosphorus on mechanical properties is considerable, as with iron of chemical composition similar to that herein discussed, a phosphorus content of 0.15 per cent gives tensile strengths of 70,000 to 85,000 psi with 1 to 3 per cent elongation as-cast in a 1¼ in. thick plate. A phosphorus content of 0.02 to 0.03 per cent gives tensile strengths of 110,000 to 125,000 psi with 4 to 8 per cent elongation as-cast in a 1¼ in. thick plate.

If a series of heats is made under the conditions that are to be used, employing base irons of different sulphur contents and making magnesium additions in different amounts, a graph such as Fig. 4 can be drawn. The data in Fig. 4 are strictly true only for the conditions used, but such a graph can be constructed for any given conditions and magnesium addition agent by experiment.

In the case of Fig. 4, the conditions were as follows: base iron composition, 3.60 per cent C, 2.30 per cent Si, 0.50 per cent Mn, and 0.16 per cent P. Type Addition Agent: 50-50 copper-magnesium alloy. Method of Addition: 8-mesh master alloy added to surface of iron in ladle at 2600 F. Post-inoculant: 0.40 per cent Si as crushed 50 per cent ferrosilicon.

It is not suggested that such conditions are ideal, or that the master alloy used is the most desirable, or that better and lower cost results are not obtainable; but the data presented will serve for purposes of illustration.

Inspection shows that the intercept, when plotted versus the sulphur content, is quite regular, and this permits the extension of the lines to indicate results with other sulphur contents, as shown in Fig. 5.

From the data in Fig. 5 it is a simple matter to determine the cost of desulphurizing cast iron with this particular addition agent, and cost comparisons

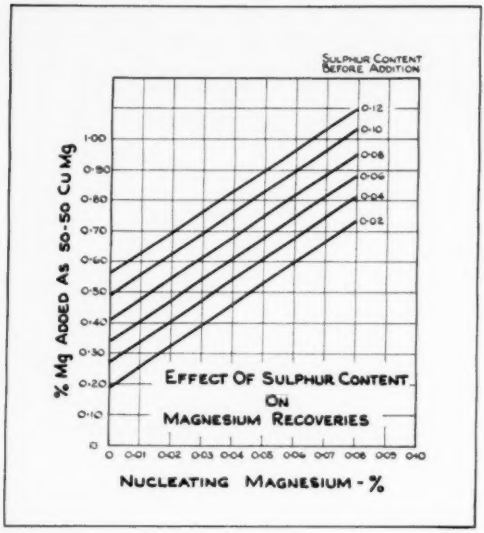
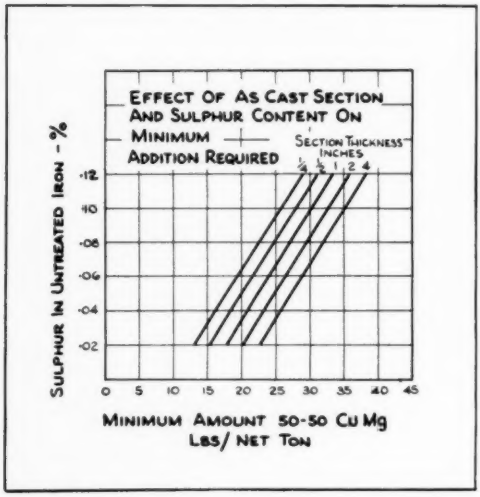


Fig. 5—Magnesium recoveries in cast irons with various sulphur contents.

with other means of desulphurization can be made. Furthermore, by repeating the work using other addition agents and techniques and plotting in a similar manner, useful comparisons can then be made and the most economically advantageous procedure chosen.

If the data presented in Figs. 3 and 5 are combined, a graph such as shown in Fig. 6 may be drawn, and such a graph is of obvious use. It should be noted that although the data of Fig. 3 are apparently independent of type and method of use of addition agent, Figs. 4 and 5 are quite dependent upon such factors and, as a result, Fig. 6 would be useful only under the conditions for which it is drawn, which are the same as for Fig. 4.

Fig. 6—Effect of as-cast section and sulphur content on minimum magnesium additions required.


Effect Of As Cast Section And Sulphur Content On Minimum Addition Required
Section Thickness Inches
¼ ½ 1 2 4
Sulphur In Untreated Iron - %
·12
·10
·08
·06
·04
·02
0 5 10 15 20 25 30 35 40 45
Minimum Amount 50-50 Cu Mg Lbs/ Net Ton

Such a graph indicates minimum additions, and in practice a safety factor should be used. It is emphasized that in the present state of knowledge of techniques, use of graphs such as Fig. 6 is not a substitute for accurate control and chemical analysis, but with use in practice and continued correlation with actual determinations of magnesium content, such graphs should tend to be self-correcting.

Foundry Melting Costs

The question of costs in foundry melting operations is always thorny, since conditions vary widely in different foundries and costs of components not only vary throughout the country but also with time. However, rough cost figures are given in Tables 2, 3, 4 and 5 and, provided it is realized that local costs of components must be inserted before a useful answer for any particular condition can be drawn, the figures may be of interest.

Data given are for three conditions, i.e., cupola melting with some desulphurizing with soda ash; cupola melting with no preliminary desulphurization; and electric melting using a so-called synthetic charge.

Table 2 — Cupola Metal Cost at Spout

40% pig iron @ $45.00/G.T.	$18.00
45% remelt @ $20.00/G.T.	9.00
15% steel scrap @ $20.00/G.T.	3.00
17½ lb. silicon briquets @ $126/N.T.	1.10
Charge Cost/G.T.	31.10
Cupola melting cost	5.60
Cost of iron at spout/G.T.	36.70
Cost per *net* ton	32.77

Table 3 — Total Cost Treated Cupola Iron, With Preliminary Desulphurization

Molten iron cost/N.T.	$32.77
Desulphurization with soda ash/N.T.	1.75
22 lb Cu-Mg @ 30c lb.	6.60
Post inoculation @ 12c lb Si	1.20
Cost Treated Iron N.T.	42.32

Table 4 — Total Cost Treated Cupola Iron — No Preliminary Desulphurization

Molten iron cost/N.T.	$32.77
29 lb Cu-Mg @ 30c lb.	8.70
Post inoculation	1.20
Cost treated iron/N.T.	42.67

Table 5—Total Cost Treated Electric Furnace Iron

55% steel scrap @ $20.00/G.T.	$11.00
45% remelt @ $20.00/G.T.	9.00
60 lb crushed graphite @ 1¾c lb.	1.05
68 lb 50% ferrosilicon @ 6c lb.	4.08
Charge cost/G.T.	25.13
Melting Cost	12.00
Cost of Iron at spout/G.T.	37.13
Cost per net ton	33.15
18 lb Cu-Mg @ 30c lb.	5.40
Post inoculation	1.20
Cost Treated Iron, per net ton	39.75

The cupola melted iron is assumed to contain 0.08 per cent sulphur as tapped, and 0.04 per cent sulphur after treatment with soda ash. The electric furnace iron is assumed to contain 0.02 per cent sulphur as tapped. The amounts of 50-50 copper-magnesium master alloy necessary for a 1-in. section are taken from Fig. 6.

Although subject to modification under local conditions, the cost figures arrived at in Tables 3, 4 and 5 indicate that the cost of treated cupola iron is slightly higher than that of treated electric furnace iron; and comparison of Tables 3 and 4 indicates that the cost of desulphurization by soda ash or other common technique is of the same order of size as the cost of desulphurizing with magnesium while treating the iron to produce nodular graphite.

Since the latter procedure eliminates one step in the handling and is therefore simpler, and since the particular magnesium addition agent used is not necessarily the lowest-cost of the most efficient agent available, it seems likely that as the metallurgy of the process is developed desulphurization as a separate step will be eliminated, and that desulphurization with magnesium will be the lowest-cost and most practical method. It is probable that the cost of magnesium additions, using the latest developments, will decrease to about one-third of the costs shown.

Summary

From the foregoing discussion it is apparent that figures on recovery of magnesium from different addition agents, as published in the literature, are of little specific use except as rough indications of efficiency, since the desulphurizing effect of magnesium has not been distinguished from the residual amounts of magnesium retained.

If desulphurization effects are taken into account, and if residual sulphur content after magnesium treatment is assumed to withhold magnesium from effective nucleation action in forming nodular graphite, a quantity called herein "nucleating magnesium" is found to apparently give good correlation in the metallurgy of magnesium-treated cast iron.

Use of this concept apparently permits some consistency to be achieved in considering results of additions of magnesium to cast iron, and its present justification is that in the author's work such consistency continues, and is corroborated by work with other addition agents. Substantiation of the data will indicate that the preliminary assumptions made are essentially correct.

The effect of as-cast section thickness on the minimum amount of "nucleating magnesium" necessary for fully nodular structure, noted above, is definite; but in irons of low phosphorus content, which are the most useful ones, the effect is relatively small. Further data from other sources will be necessary to determine whether the relationships shown in Fig. 3 are substantially correct or must be modified.

In view of the widespread interest in nodular cast iron and the metallurgical importance of the material, a considerable amount of research on various phases of the subject is proceeding in foundries and laboratories, both in North America and in Europe. However, an unsatisfactory condition has developed in that very little factual data or detailed results are being published, and the development of commercial use of the material is thereby retarded.

The metallurgy of nodular cast iron involves departures in many instances from that of its nearest relatives, gray cast iron and malleable cast iron, and much work must be done and verified before the material will be on a sound metallurgical basis. It is hoped that publication of these notes and observations will encourage publication by others of results of work in this field, even if only to refute some of the foregoing data by presentation of substantial evidence to the contrary.

Future Meetings and Exhibits

AMERICAN INSTITUTE OF MINING & METALLURGICAL ENGINEERS, midyear meeting, Columbus, Ohio—Sept. 25-Oct. 1.

AMERICAN IRON & STEEL INSTITUTE, regional technical meeting, Hotel Statler, Buffalo, N. Y.—Sept. 29.

MAGNESIUM ASSOCIATION, midyear meeting, Greenbrier Hotel, White Sulphur Springs, W. Va.—Sept. 29-Oct. 1.

STEEL FOUNDERS' SOCIETY OF AMERICA, fall meeting, Greenbrier Hotel, White Sulphur Springs, West Virginia—Oct. 3-4.

AMERICAN COKE & COAL CHEMICALS INSTITUTE, annual meeting, Skytop Lodge, Skytop, Pa.—Oct. 3-5.

ASSOCIATION OF IRON & STEEL ENGINEERS, annual convention, William Penn Hotel, Pittsburgh—Oct. 3-6.

AMERICAN IRON & STEEL INSTITUTE, regional technical meeting, Drake Hotel, Chicago—Oct. 6.

NEW ENGLAND REGIONAL FOUNDRY CONFERENCE, Massachusetts Institute of Technology, Cambridge, Mass., Oct. 7-8.

ASSOCIATION TECHNIQUE DE FONDERIE, 23rd annual congress, Paris, France—Oct. 10-11.

AMERICAN SOCIETY FOR TESTING MATERIALS, Pacific Coast Meeting, Fairmount Hotel, San Francisco—Oct. 10-14.

ELECTROCHEMICAL SOCIETY, 96th convention, La Salle Hotel, Chicago—Oct. 12-15.

FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION, annual meeting, The Greenbrier, White Sulphur Springs, West Virginia—Oct. 13-15.

AMERICAN SOCIETY FOR METALS, metal congress and exposition, Public Auditorium, Cleveland—Oct. 17-21.

REGIONAL FOUNDRY CONFERENCE, Metropolitan, Philadelphia and Chesapeake Chapters of A.F.S., Stevens Institute of Technology, Hoboken, N. J., Oct. 21-22.

NATIONAL SAFETY COUNCIL, 37th National Safety Congress and Exposition, Chicago, Oct. 24-28.

GRAY IRON FOUNDERS' SOCIETY, annual meeting, Edgewater Beach Hotel, Chicago—Oct. 27-28.

MICHIGAN REGIONAL FOUNDRY CONFERENCE, A.F.S. Michigan Chapters, Michigan State College, East Lansing—Oct. 28-29.

NATIONAL AIR POLUTION SYMPOSIUM, Huntington Hotel, Pasadena, Calif., Nov. 10-11.

NATIONAL FOUNDRY ASSOCIATION, annual meeting, Waldorf-Astoria Hotel, New York—Nov. 10-11.

NEW YORK STATE REGIONAL FOUNDRY CONFERENCE, A.F.S. Upstate New York Chapters, Syracuse University, Syracuse, N. Y.—Nov. 25-26.

OHIO REGIONAL FOUNDRY CONFERENCE, A.F.S. Cincinnati District, Canton District, Northeastern Ohio, Central Ohio and Toledo Chapters, Netherlands Plaza Hotel, Cincinnati—Mar. 10-11, 1950.

54th Annual Foundry Congress and Exhibit, American Foundrymen's Society, Public Auditorium, Cleveland. May 8-12, 1950.

POURING BRAKE SHOES IN INDIA

J. S. Gupta
Foundry Foreman
Locomotive Central Workshops
B.B.&C.I. Railway
Ajmer, India

MANY FOUNDRIES in the countries of the East are still using primitive methods and appliances. To them the modern mechanized foundry of the West appears to be quite wonderful, and it is difficult for them to realize the world advances in the foundry arts.

The majority of the foundries in India are still making molds on the foundry floor by manual labor, using a flask for the cope only where it is absolutely essential. By this method they produce castings in quantities just sufficient to meet local demands.

Recently a set of flasks was designed and made in our foundry whereby light castings can be made in large numbers without the necessity of using molding boxes. The complete arrangement is shown in Fig. 1. Items "A" and "B" are the cope and drag flasks, respectively, and item "C" is the pattern plate. These three pieces are cast from an aluminum alloy, keeping in view the lightness and strength of this metal. The pattern plate in this case was designed to make molds for brake shoes for the railway rolling stock—castings which are always in great demand.

Item "D" is a slide which is moved in and out of the cope by pressing handle "H", the movement being limited to about ⅜ in. When handle "H" is free the position of slide "D" is ⅜ in. inside the cope all around, and when handle "H" is pressed the slide comes in flush with the inner edge of the cope. Items "E" and "F" are the wooden boards.

Additional equipment used includes cast iron top plates with lifting handles at the ends and a hole in the center to allow pouring. The plates serve as top weights, and the 40-lb. weight is not sufficient to crush the molds. Pressure plates and weights are applied at the mold sides and ends to prevent runouts.

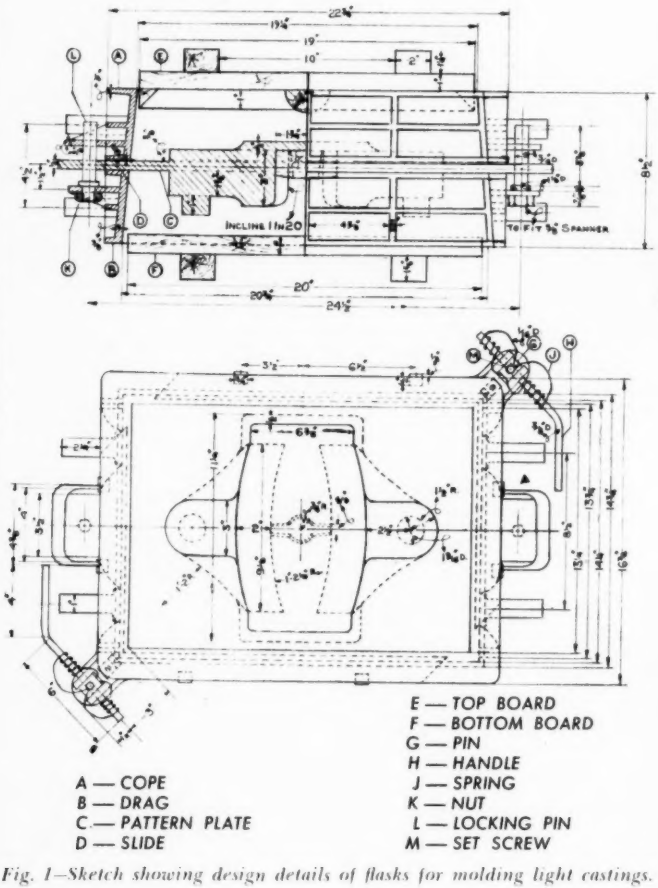


Fig. 1—Sketch showing design details of flasks for molding light castings.

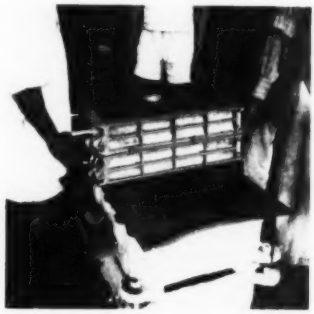
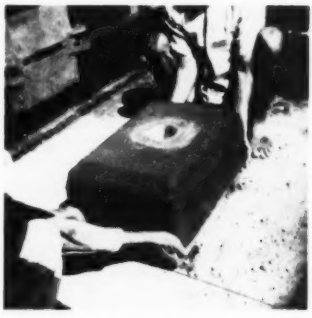


Fig. 2—Cope and drag flasks (above) are held together while operators push slides in cope flask outward by pressing handles shown at "H" in Fig. 1. The flasks are carefully removed and the closed molds are placed in long rows on the pouring floor (below). Side plates and weights are placed and the spaces between molds filled with floor sand.



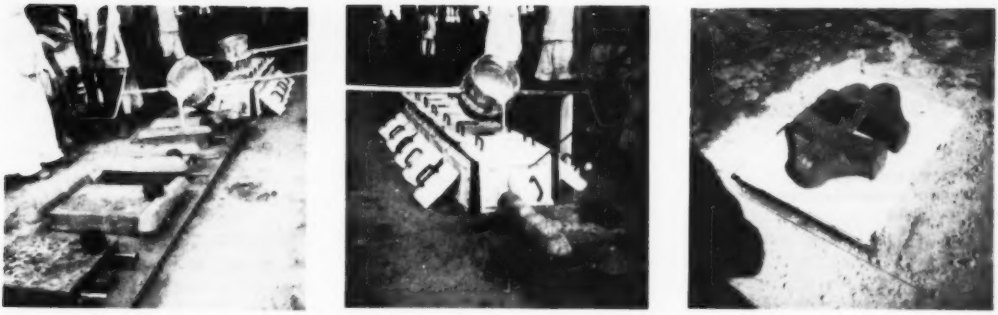


Fig. 3—Pouring metal (above) in molds made on the floor by the old method. Molds made by the new method (center) are poured through hole in the top weight, and (above) a pair of the brake shoe castings produced.

Items "A," "B" and "C" (Fig. 1) are put together on a bench with the drag on top and the cope on the bottom. Facing sand is then applied to the pattern, and the rest of the box is filled with ordinary floor sand. The mold is rammed by hand, or by machine if available, and vented by a pricker made of bamboo or some other hard wood. A wooden pricker is preferred to a steel wire as the latter is likely to damage the patterns. Wooden board "F" is then placed on top of the drag and the whole mold is inverted.

The cope is then rammed in the same manner and wooden board "E" is placed on top of the cope. A few light taps with a flat rammer on top of this board serve to press the mold evenly on all sides, as well as form a pouring cup in the center. Wooden board "E" is then removed, the downgate is punched in the pouring cup with a slightly pointed iron pin. The cope is vented in the same manner as the drag.

The cope is then lifted and placed on one side. Pattern plate "C" is also lifted. Minor mold repairs are made and the two cores for 1.9 16-in. diameter holes are fixed in the core prints. The cope is then replaced on the drag. Two operators, one on either side of the mold, hold the drag and cope together and, by pressing handle "H" with their thumbs, push the slide "D" outward and lift the drag and cope flasks together (Fig. 2). The closed mold is released on wooden board "F" and placed on the pouring floor.

Subsequent molds are made in the same way and placed side by side on the floor, the spaces between them being filled with floor sand and vented. Side plates and weights are applied on sides and top plates are placed in proper position. Arranged in long rows, the molds are ready for pouring (Fig. 3).

When the poured metal has solidified the wooden board "F" is removed for further use, and the castings are allowed to cool in the sand for a short time. After cooling, these brake shoe castings, which are poured in pairs, require but little cleaning other than removal of gates and risers.

FORESEE DIE CAST ALUMINUM AUTO BODIES

RECENT EXPERIMENTS in the development of large one-piece aluminum die castings at the Willow Run, Mich., plant of the Kaiser-Frazer Corp. have proven so successful that officials of the company predict widespread use of the lighter metal in auto bodies.

The largest casting perfected after several years of extensive research and development is an inner door frame weighing before trimming 13⅜ lb and measuring 43⅜ in. by 33 in. Success of the experiment on the door frame has special significance, company officials claim, because it is a step toward elimination of one of the most costly multiple stamping operations in body building. According to Clay P. Bedord, Kaiser-Frazer executive vice-president, it is reasonable to assume that these developments will lead to lighter and probably less expensive automobiles in the future.

Mr. Bedord spearheaded the search for lower cost fabricating materials in conjunction with engineers of the Doehler-Jarvis plant in Toledo. Applying the potential savings to doors alone, Mr. Bedord listed (1) reduction of 8.6 lb per door, or 34.4 lb for a four-door sedan (2) elimination of four steel stampings on each door—a total of 16 stampings per car (3) elimination of at least one large welding jig, and (4) elimination of a press line to form, trim and flange steel stampings.

According to Mr. Bedord, the die casting method also offers a number of indirect benefits—door sizes would be more exact, and there would be no "spring backs." Because of better fittings and greater lightness of the door, it might also be possible to eliminate the jigs on wheels required to assemble all-steel doors.

Other advantages cited include (1) use of a door pillar with less reinforcement (2) lighter hinges (3) easier accessibility for repairs (4) quicker, more exact fitting of hardware, and (5) better weather sealing.

Completed doors with cast aluminum frames and an outer skin of steel have been laboratory and road tested for many months and, according to company officials, have been successful far beyond initial expectations. Thousands of slammings have failed to uncover any structural defects.

Kaiser-Frazer engineers are studying development of other die castings for parts with relatively high fabricating costs. These include inner frames for instrument panels and rear deck lids, both of which offer substantial savings in labor assembly costs. Production thus far has been on an experimental basis.

QUALITY CONTROL REVIEW . . .

Tests for Brass, Bronze and Nickel Alloy Castings

William Romanoff
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H. Kramer & Co.
Chicago

REMARKABLE PHYSICAL PROPERTIES are sometimes obtained on standard as well as newly developed alloys, but they have no value if the foundryman cannot obtain good castings from the alloy. Just what makes a good casting has been very much discussed by the producer and purchaser. The foundryman is often left to the mercy of the designing engineer, metallurgist and the testing inspector because agreement cannot be reached as to what properties, if any, approach practical usage.

Naturally, it is better for all concerned if a bad casting can be scrapped in the foundry than if it is machined and assembled before detection of the defect. It is therefore necessary for simple and inexpensive tests to be devised for the small as well as the large foundry. Of course, the large foundry can continue with conventional control tests such as tensile strength, yield strength, elongation, etc., even though they are expensive and usually too late to be of much good in the production of good castings.

These mechanical tests do serve some purpose. They help to accumulate data for the designer, even though they are not always properly related to service life; to develop specifications for the purchasing agent; to gather fabrication information for the manufacturing unit; and to establish standards of quality for the testing inspectors.

As most foundries use gates and sprues from their own castings, these should be properly segregated and care should be exercised to avoid any mixup in the analyses. In some instances, foundries use the borings returned from the machining of their own castings and it becomes the responsibility of the foundry to see that they are not remelted before being practically rid of moisture, oil and free iron—particularly the latter two. It is possible that some prime metals, such as copper, tin, lead, zinc, nickel, etc., are also used in the foundry.

Ingot Quality Is Important

By far the largest proportion of castings made in this country are from composition ingots. Unfortunately, an ingot is an intermediate product that must be remelted in the foundry and poor melting practice has often ruined good ingot. It is not a finished product such as a watch, that can readily be judged by its appearance, or whose efficiency is easily observed. So much can happen in a foundry during the process of converting ingot into the finished product that it is hardly possible for conventional tests to determine the ultimate quality of the casting. However, these conventional tests can quite definitely separate those ingots which have a chance to produce good castings from those ingots which cannot do so.

Detailed methods for chemical determination of various elements in copper base alloys can be found in the American Society for Testing Materials' *Methods of Chemical Analysis of Metals.* Some elements, such as aluminum, silicon, nickel, etc., may be beneficial, detrimental or wasteful, depending on their ultimate use. Chemical specifications, together with the maximum impurities, can also be found in the above reference as well as in other technical society handbooks and the published specifications of the various Government agencies.

A method of sampling ingot metal when chemical analysis is necessary can be found in ASTM Specification B30-45. One method for drilling selected

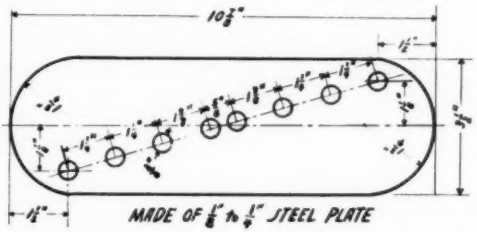


Fig. 1—Template used in drilling ingots in order to obtain representative samples for chemical analysis.

sample ingots uses a template. The template is made to correspond to the exact shape of the top surface of the ingots and holes are drilled in the template as shown in Fig. 1. The ingots are then drilled through these holes through the entire height of the ingot, which precludes chances of selecting a segregated area in the ingot and getting an erroneous analysis.

Two general types of ingots—the "smooth top" and the "rough top"—are available but the merits or demerits of these will not be discussed. The surface of the ingots should be clean and free from slag inclusions, and should not have the gray, greasy appearance caused by excessive amounts of aluminum and/or silicon, unless the particular alloy in question happens to include these as beneficial elements.

One visual observation that is essential is to determine whether the ingot has a proper set or whether the top is puffed. If the latter, it definitely indicates a highly gassed ingot which has not been properly refined and which upon melting is apt to give considerable trouble. In addition, it often happens that even good quality metal poured into overheated iron molds will caused puffed ingots. As a safety factor it is best to reject ingots that do not have a level or slightly concave surface appearance.

Five papers, sponsored by the Annual Lecture Committee of A.F.S., were presented at Lecture Course Sessions of the 52nd Annual A.F.S. Meeting. In this issue, test procedures for quality control in the brass and bronze foundry are described. Of other papers in the series, steel was published in the January, 1949, and malleable iron in the July, 1949, issues of *American Foundryman*. Gray iron and aluminum and magnesium quality control will appear in future issues.

The fracture of the ingot, while not too revealing, should be uniform in color and free from slag and oxide inclusions or occluded gases that might create a necessary refining in the foundry.

The deep etch test, usually an immersion in a nitric-hydrochloride acid solution, indicates little as to the quality of the ingot. It definitely will outline any internal shrinkage in the ingot, but this condition is immaterial, since the ingot is ultimately remelted. The shrink condition will not be transferred to the casting unless it is due to some high-shrink-forming impurity. The deep etch test will not detect the presence of the shrink forming impurity; this can be determined only by chemical analysis. It must be remembered that shrinkage can occur in an ingot because it is not gated or risered to eliminate shrinkage but is merely poured into an open iron mold. Shrinkage of a good quality ingot is usually controlled by temperature of pouring as well as by mold temperature. In general, the deep etch test on ingot is apt to be misleading and is not recommended.

While it is true that ingots are often accepted or rejected on the basis of chemical analysis, this is often a fallacy. Due to the various prices of the elements comprising the composition of the ingot, the purchasing agent has no other method of determining whether or not he is obtaining that for which he has paid. The chemist never determines the percentage of oxides or gases contained. An ingot with an analysis much closer to the desired chemical specifications may be much less desirable to the foundryman than one with a greater variation in the chemical analysis but still within the maximum and minimum limits of the specification. The converse is also true.

Ingot Acceptance Basis

For this reason, acceptance and rejection should be based on test bars melted and poured from ingots, using foundry practice as recommended in the A.F.S. manual, RECOMMENDED PRACTICES FOR THE SAND CASTING OF NON-FERROUS FOUNDRY ALLOYS or as revised by other general authoritative and accepted practices.

The mechanical properties necessary for acceptance should be those recommended by the ASTM. The separately-cast test bar used for sand casting could be the one used for the acceptance of the ingot. The design could be similar to the one illustrated in Fig 7, or any of the test bars illustrated in the 1949 *Tentative Specifications for Copper Base Alloys for Sand Castings* (ASTM Designation B208-49T).

Trial castings could and should be used as an aid in the determination of quality ingots. A mold or two of castings, which the foundry involved generally has running in its production line, could be poured and the castings tested for pressure or whatever other physical or mechanical property is most desired by that foundry. All of these trial castings could be poured from the same heat of metal from which the test bars were poured and the standards required in these trial casting tests should be determined by mutual agreement between the consumer and producer of ingots.

Sands for the brass foundry fall into three classes—natural bonded, synthetic, and blended. When the sand is actually prepared by the foundry for its own use from silica sand and the necessary bonding agents, it is generally referred to as synthetic. If, however, this same material is purchased as a prepared mixture, it is referred to as blended. Natural bonded sand refers to a sand, as mined, containing sufficient bonding material for molding purposes.

The quality of these sands is generally based on grain fineness, clay content, green compressive strength, permeability, and moisture content, all of which are fully described in the A.F.S. FOUNDRY SAND TESTING HANDBOOK.

A graded silica sand is usually used as a base for cores in the brass foundry. Its application is generally determined by the grain fineness, clay content, and percentage of moisture. These are fully described in the A.F.S. publication, MODERN CORE PRACTICES AND THEORIES, by H. W. Dietert.

Binders are either dry or wet depending upon the condition in which they are added to the sand mixture. The former include bentonite, cereal binders, etc., while the latter include the numerous core oils,

Fig. 2—Determining properties on the tensile machine.

linseed oil, etc. Various tests for the quality of the core mixtures may be found in the above reference.

It is always well to keep a complete record of the life of refractories such as crucibles, liners, firebrick and fireclay, and this seems to be the most practical method of setting up standards for future purchases.

The two most generally accepted tests for fuel oil are for viscosity and sulphur content. The value of this latter test is debatable for there are as many foundrymen and metallurgists who feel that sulphur is not a detrimental element in brass and bronze as there are those that believe to the contrary.

Following are tests which can be run in the foundry or other parts of the plant, with or without the aid

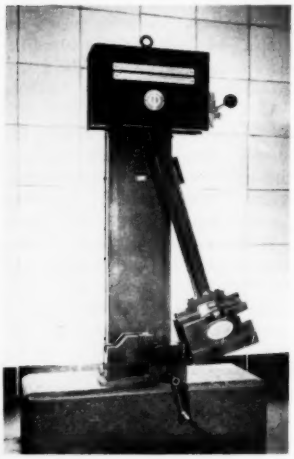


Fig. 3—Machine used for making impact tests which will indicate the resistance to sudden blows which may be expected from the material.

of the chemical or physical laboratories, and are more or less shop tests. The length of time necessary for most laboratory tests often prevents practical usage in a production foundry.

Temperature Control of Castings

Every foundry, whether large or small, should have some sort of temperature measuring equipment if its aim is the consistent production of quality castings. Probably as many defective castings can be traced directly or indirectly to improper pouring temperatures as to any other condition in the foundry. Even if the exact temperature for pouring any particular type of casting could be determined, it would be impossible to pour every casting at that temperature in production due to the drop in temperature of the metal in the ladle during the pouring operation.

Assuming that the average amount of metal poured from a ladle or crucible is 200 lb, the temperature drop in pouring this amount of metal is a minimum of 100 F and often runs as high as 150 to 200 F. This drop in temperature may be reduced by insulating the pouring ladles, but this is impractical when melting and pouring from the same crucible. It is therefore necessary to start at a temperature which, while not the best, will still give satisfactory castings, so that the last metal poured from the crucible will be sufficiently hot. If this is impossible, it then becomes necessary to pour from a smaller crucible or pour only part of the metal from the larger one.

The proper pouring temperature is usually determined by the size and cross-section of the casting as well as by the number of castings in the mold. Without delving too much into the realm of foundry practice, it is fundamentally sound to pour at the coldest temperature possible but still hot enough to avoid misruns and internal shrinkage.

There are many good pyrometers on the market for the determination of brass and bronze pouring temperatures and practically all of them are of the immersion type. The use of the open thermocouple is apt to give an erroneous reading due to the by-passing of the current over the surface of the metal, thereby giving surface readings.

This can be avoided by the use of a stainless steel protection tube in which the insulated wires are inserted into the tube and the hot junction is welded to the closed tip of the tube. A carbon or some other refractory tube could be used providing the temperature lag is not too great. It becomes impractical if the temperature reading cannot be made within 30 seconds or less.

An optical pyrometer is seldom used due to the formation of an oxide on brass and bronze when exposed to the atmosphere, thus reducing the possibility of a correct reading.

The temperature of the metal in the furnace is occasionally taken by immersing a steel rod into the bath of metal and then pulling the rod out to see how much, if any, sticks to the rod. This offers possibilities of contaminating the metal with iron, and in addition it is more of a viscosity test for the metal in the furnace than a temperature test, making it hardly recommendable for temperature determinations.

Melting Control

The literature published on the deleterious effect of reducing gases in brass and bronze is voluminous. Naturally, much of this metal contamination can take place during the melting operation. A discussion of the theory of melting under a slightly oxidizing atmosphere will not be attempted here, but the practice is almost mandatory.

When melting in oil, gas or coke-fired crucible furnaces, or in barrel, box or pear-shaped open-flame furnaces, the foundryman has three methods of determining the type of atmosphere which surrounds the metal during the melting operation. In all these tests, it is unwise to check the flame while the metal is in the solid or partially solid state. It is best to wait until the metal is molten. The tests are:

(1) Visual—a short, sharp flame with a slight green tinge around the outer edge indicates an oxidizing atmosphere. It is a mistaken idea that a green flame is always oxidizing. A long, lazy, green flame has been found to be reducing upon numerous occasions. For this reason visual determination, unless done by a highly skilled, experienced operator is often inaccurate. A yellow, yellowish-red or smoky flame is an indication of a reducing atmosphere.

(2) Orsat or other gas testing equipment gives an accurate analysis of carbon dioxide, carbon monoxide

and oxygen in the sample, but the difficulty lies in getting the proper sample. There is always danger of a gas reaction with the sampling tube. Of course, the time necessary to run the test is also a slight handicap. This equipment is very good in boiler or stack operation but its practicability is questionable when used for atmospheres surrounded by flame. A porcelain tube is usually the safest for sampling.

(3) Probably the most accurate qualitative method —due to its simplicity, practicability and speed—is the zinc test. A small piece of clean virgin zinc is passed through the open flame for about five seconds. If it turns black, the atmosphere is highly reducing. If it turns straw-yellow to light gray, it is slightly reducing. If it does not change color, the atmosphere is oxidizing. Its very simplicity should permit a test of every furnace immediately after the metal is molten, with correction of the flame, if necessary.

Even though the flame is oxidizing at the point where it leaves the furnace and comes in contact with secondary air, this does not necessarily indicate that it is oxidizing over the surface of the metal, although the possibilities are in its favor. If, however, the flame is reducing when leaving the furnace, it certainly will be reducing over the surface of the metal.

Fractures of Castings or Test Pieces

Probably no single test can be used by both the large and small foundry to determine metal quality of the castings in less time than by fracturing. (EDITOR'S NOTE: The fracture test is under extensive investigation in an A.F.S.-sponsored research project.)

A foundryman or metallurgist should acquaint himself with typical fractures and their interpretation. Each of the alloys used should be melted under *oxidizing* conditions and brought up to an extremely high temperature and poured into some type of bar or one of the regular production castings that can be readily fractured.

The metal should be cooled and the bar or casting poured after each 100 F drop in temperature until the castings are about to misrun. This same procedure should be repeated with the metal melted under *reducing* conditions.

It is most important that fractures be examined immediately after the casting or test pieces are broken, otherwise they have a tendency to tarnish after exposure to the air and are apt to be misleading. It is possible to determine the best pouring temperature range, as well as to distinguish between the fractures of castings that have been melted under oxidizing atmospheres as against those melted under reducing conditions.

Any attempt to describe to the foundryman the color or texture of the fracture that he should look for would be confusing. Only with experience and close observation can he be taught—but once he gets the knack of interpreting fractures, he has an invaluable tool for a quick test of metal quality.

Castings should be fractured periodically during the day and the information obtained can be used in improving and correcting improper practices when necessary. It might be found impractical to fracture a pressure casting from every heat poured in a production foundry, but this could be the means of effecting a considerable saving. If the fracture showed poor quality and the possibility of leaking under pressure, it certainly would be much cheaper to scrap the castings in the foundry and have them remelted than to have them machined, assembled and then found to be defective at the test bench.

At the test bench the fracture test is almost a necessity. For example assume that some castings are being tested under water pressure. Each defective casting should be fractured at the exact point of leakage. If sand or slag inclusions are found, the remedy is obvious. If the fracture is porous and discolored, it may be the result of an internal shrink, but further checking is necessary before any conclusions can be drawn. The casting should then be fractured at one or more points that do not show leakage.

Fig. 4—Equipment used in making photomicrographs.

If the fractures at these points are homogeneous and uniform in color, the first observation of a shrinkage condition is likely correct, for a shrinkage area is usually localized. If, however, all of the fractures of the particular casting were discolored, then the trouble was not shrinkage, but probably due to too high a pouring temperature or melting under a reducing atmosphere.

The causes of defects in non-ferrous sand castings are more thoroughly discussed in *"Analysis of Defects"* published in A.F.S. TRANSACTIONS in 1935 and 1940.

Another illustration of the value of fractures is found in polished goods such as are manufactured for the plumbing industry and similar lines. It is not uncommon, after a casting is chromium plated, to find surface porosity. Fracture will reveal whether it is merely on the surface and can be eliminated by a little extra polishing or whether the entire casting is porous.

In the melting and molding of manganese bronze, the Navy also recognizes the value of fractures. The foundry manual published by the U. S. Navy Bureau of Ships, *Melting and Molding of Ferrous and Non-Ferrous Metals and Alloys*, states:

"A cup sample should be taken by pouring the metal into a finger mold, which consists of a flat plate of cast iron or steel with half round grooves approximately

1¼ in. in width and 12 in. in length. At a dull red color the solidified metal should be placed over a compressed air line by means of tongs, and the sample slowly cooled from the bottom to the top until most of the heat is radiated. The test sample should then be immersed in water and then bent in a vise with a heavy hammer until it breaks. The test bar should not fracture at an angle less than 90 degrees and the fractured surface should have a pink tinge with a slight sparkle."

Test Plugs

In pouring castings from such metals as pure copper, silicon bronze, etc., which are very susceptible to "spewing" or "mushrooming" of the sprue or riser if improperly melted, it is well to pour a test plug before pouring the casting. Poor metal quality and resultant unsound castings are thereby detected and possibly corrected.

Either a round plug about 1 to 1½ in. in diameter and about 5 or 6 in. long or a square plug about 1 x 1 x 5 in. is forced into a pail or box of molding sand. The metal is then either scooped from the furnace and the plug poured or is poured direct from the crucible or ladle. Time is then allowed for the plug to cool and if it sets properly, the castings are poured. If not, the metal is either treated in an attempt to correct the gassed condition or it is pigged for future remelting. The test plugs also may be used as a fracture test piece.

Visual Inspection of Scrap Castings

The total percentage of scrap losses in a foundry is almost meaningless in regard to correction. Certainly the same correction is not necessary for a shifted casting as would be necessary for a misrun.

Most defective castings are evident to the eye and in the majority of well regulated foundries, a meeting is held daily between the foundry foremen, metallurgists, and any others interested. Castings are sorted and listed by defects, such as blows, shifts, misruns, sand wash, etc. This gives a general idea as to the causes and when they are known, the remedies can be applied.*

Specific Gravity of Test Pieces or Castings

The specific gravity of a substance is its weight in air divided by the weight of a volume of water equal to the volume of the sample being tested. This is a simple, speedy test and a very good tool, particularly for pressure castings, as the physical properties generally increase with an increase in specific gravity. It is not generally used as a method of acceptance or rejection but more to check the trend of the foundry with reference to soundness of castings.

In many cases intricately cored castings are extremely difficult to measure accurately, particularly the internal sections. It is important that these sections be correct in thickness to insure (1) that additional weight has not been added which would make the finished casting heavier than permissible; (2) that the sections are not thinner than designed, which would detract from the strength of the casting; and (3) that hollow cavities have not been reduced in area by the metal thickness of the sections, whereupon any flow of liquid or gases intended by the designer is reduced.

A ready means of testing for these discrepancies is by accurately weighing each casting or by measuring the displacement caused by immersing the casting in a suitably filled measuring jar or vessel. In certain instances where extreme accuracy is demanded from the founder, a tolerance of plus or minus one per cent of a given weight is permissible.

Details of the specific gravity tests can be found in Chapter I of *Identification and Qualitative Chemical Analysis of Minerals*, by O. C. Smith, or almost any other books pertaining to the identification of minerals.

Brinell and Rockwell Hardness Tests

Where hardness tests are desired, the two most generally specified are the Brinell and Rockwell, although there are other methods of hardness testing such as the Vickers, Knoop, Scleroscope, etc.

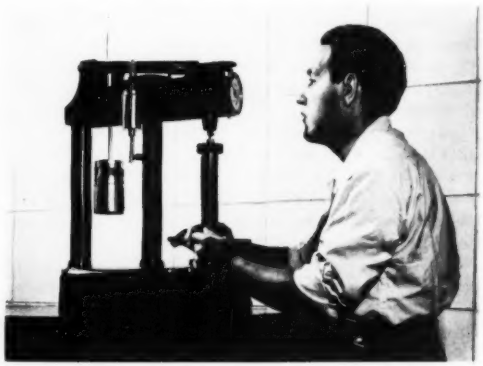
For practical purposes, hardness may be defined as resistance to penetration or possibly resistance to abrasion. The Brinell test consists of forcing a hardened steel ball of a definite diameter under a definite pressure into the surface of the metal. The diameter of the impression is then used to calculate the hardness. The Rockwell test consists of forcing a hardened steel ball into the surface of relatively soft metals, or a diamond cone into the surface of the harder metals, with both penetrators under definite loads.

The Rockwell hardness measurement is not based on the total depth of penetration but upon the increment of depth due to an increment of load from a minor to a major value. The greater the increment of penetration, the softer the material, and vice versa.

The real utility of any hardness test in the ordinary brasses is questionable because most of them contain lead, which is practically insoluble in the alloy in the solid state, and there is always the possibility of penetration into a lead spot, with resultant misleading interpretations. This is also possible due to slight variations in the surface of sand castings. For the average brass casting this is not acceptable.

Hardness tests are particularly applicable to man-

Fig. 5—Making a Rockwell hardness test.



*ANALYSIS OF CASTING DEFECTS contains valuable scrap reduction information useful in all types of foundries. Only four of the 31 defects illustrated, described and explained in this A.F.S. book are found in gray iron alone.

ganese bronzes, aluminum bronzes, and other high strength alloys and are used to a considerable extent in control work. If hardness impressions are taken on areas that will not be stressed, they are usually considered as non-destructive and the tested castings can be returned to the production line. If it is not desirable or practical to test castings, a test specimen may be cast in conjunction with the castings.

The advantage of this test is its rapidity and the fact that results are obtainable for acceptance or rejection within a short enough time to eliminate danger of a heat of castings being lost due to lack of storage space. The conversion of Brinell to Rockwell and vice versa is not accurate for cast materials to the same extent as for wrought materials.

Fluidity Tests

The ability of a molten metal or alloy to completely fill a mold has long been of prime importance to the foundryman. Lacking a ready means to measure this property, he has used various expedients, such as change in mold design, gating, sand conditions, pouring temperature, metal composition or the use of a "fluidizer", all of which have served their immediate purpose either collectively or individually.

It is becoming increasingly more important, however, to know before pouring whether a metal or alloy has the required fluidity to make suitable castings and to know to what extent the presence of minor quantities of other elements, changes in melting procedure, or molding conditions will affect this property.

It is not the author's purpose to discuss factors that affect fluidity nor the test pieces such as the fork or the spiral. The importance of the fluidity test in large furnace operations is unquestionable; whether it is impracticable in the smaller furnace operation found in the brass foundry is another matter. The fluidity test is better left to research and not to production in the brass foundry. It is thoroughly discussed in a paper, *"A Practical Method for Studying the Running Quality of a Metal Cast in Foundry Molds,"* by C. M. Saeger and A. J. Krynitsky in the 1931 A.F.S. TRANSACTIONS.

Another paper for reference is *"A Modification of the Saeger Fluidity Test as Applied to Red Brass,"* by George P. Halliwell in the 1938 TRANSACTIONS. Both of these papers have complete bibliographies. A review of the different methods of testing fluidity can be found in *"Fluidity Testing of Foundry Alloys"* by K. L. Clark in the 1946 TRANSACTIONS.

Deep Etch Test of Castings

Where radiography is not available, the deep etch of brass castings can be used as a valuable tool to determine the best method for gating castings. Defects on the original gating are shown and corrections can be made. This is particularly true where shrinkage is concerned. Such phases of gating as elimination of dirty surfaces and excessive misruns require other methods of attack.

Deep etch tests offer certain advantages over the older method of merely fracturing the piece, because sections can be made longitudinally and through heavy sections which would be difficult to fracture. A cleaner and more complete picture of the condition is obtained through the greater portion subjected to examination and the chances for detection of defects are somewhat greater with the etched sections.

Of course, the disadvantage of the deep etch test over the fracture test is that the fracture will occur through the weakest structure and this may be overlooked when sawing through a section for deep etching.

In the paper, *"Deep Etching of Brass Applied to Gating Problems,"* by R. W. Parsons, published in the 1931 A.F.S. TRANSACTIONS, he discusses several practical applications of this test. For example, causes of leaks resulting in defective globe valve castings were investigated by deep etching; regating reduced the losses to a minimum. The test itself consists of etching in nitric acid. When tin is present in the alloy, 10 per cent of hydrochloric acid is added to keep tin oxide in solution.

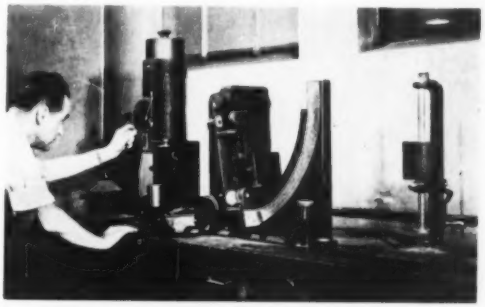


Fig. 6—Sand testing equipment used for making moisture, permeability, and green strength determinations.

Pressure Testing of Castings

In foundries making valves, fittings and other castings to withstand pressure, no compilation of foundry losses is complete until the number of "leakers" has been determined by actual pressure test. These tests are usually hydrostatic, steam or air tests, depending on the type of service the casting must undergo.

Unfortunately, visual examination of the castings in the foundry does not always determine whether they will withstand pressure under test. Often those with the smoothest surface are the most vulnerable. They are therefore machined and assembled before test, and if they are defective considerable expense is involved. Paradoxically the pressure test can become a very valuable tool in reducing "leaker" losses to a minimum. Proper analysis by some of the methods mentioned in previous paragraphs, as to what caused the defect such as shrinkage, improper pouring temperature, etc., can then be made.

Details of these pressure tests are discussed thoroughly in a paper, *"Non-Destructive Inspection of Castings,"* by Clyde L. Frear and Robert E. Lyons in the April, 1946, issue of AMERICAN FOUNDRYMAN.

Molding and Core Sands

Quality control of castings is so dependent upon the properties of the sand utilized that sand testing

equipment is almost essential. A great number of characteristics of a casting, such as its surface finish, dimensional accuracy, and the absence of such defects as blows, scabs, washes, surface porosity, etc., can be controlled largely by proper sand conditions. Thus, it is essential that the foundryman understand the characteristics of the sand with which his molders work and that he have proper tools to help him distinguish between good and poor sand conditions.

The following tests should be made daily if equipment is available:

Permeability—That physical property which permits gas to pass through the molded mass of sand.

Green Strength—The strength (compressive, shear, tensile or transverse) of a tempered sand mixture.

Moisture—Water which can be driven off by heating at 212 to 230 F.

While many physical and mechanical properties of foundry sand mixtures are of interest, the above three, plus grain distribution, which should be a bi-monthly test, are of greatest importance.

Flowability is becoming recognized as a test of some value. This is the property of a foundry sand mixture which enables it to fill pattern recesses and move in any direction against pattern surfaces under pressure. Another test coming to the attention of foundrymen is the mold hardness test. The various sections of the rammed mold can be compared, as well as the comparative hardness of the cope as against that of the drag. The mold hardness actually informs the foundryman as to the relative amount of pressure used to ram the mold section.

Visual examination, although not too accurate, will give some indication as to whether or not cores have been properly baked. If the color of the core is a nut brown, it approximates correct baking. A lighter color indicates insufficient baking and a darker color indicates overbaking.

Of the latter two evils, the under-baked is probably the worst because the baking will probably be continued in the mold when surrounded by the hot metal, with a resultant elimination of water vapor, oxides of carbon and hydrocarbons. The decomposition of water vapor, and the hydrocarbons will create considerable hydrogen, which results in unsound castings.

Visual tests may be obscured by iron oxide or some other substance that may cause a change in color. Iron oxide is sometimes added to increase hot strength, which often prevents metal penetration into the core.

Where sand testing equipment is available, the core tests most generally used are the green strength, tensile strength and dry permeability. These tests are fully described in the A.F.S. publication, MODERN CORE PRACTICES AND THEORIES, by H. W. Dietert.

It seems hardly necessary to mention that the finished cores should be cleaned, inspected and gaged for size before usage.

Control of Core Baking Ovens

In the baking of oil sand cores two things occur. First, the moisture is driven off. Following this, the temperature rises, causing drying and partial oxidation of the oil, thereby developing the strength of the core.

Time and temperature being such important factors, it is essential that proper instruments be supplied for control of both. The temperatures most frequently used in baking cores vary from 375 F to 500 F and the time varies with the cross section of the core.

A test recommended in the foundry manual of the U. S. Navy Bureau of Ships, *Melting and Molding of Ferrous and Nonferrous Metals and Alloys*, will help correlate the temperature and time necessary for baking cores:

"To establish a full appreciation of the problem of drying cores, a series of 3 in., 5 in. and 8 in. cube cores should be made without rods and then baked at temperatures of 400 F, 425 F, 450 F, 475 F and 500 F for varying predetermined times. After being taken out of the oven and cooled, they should be cut open with a saw to determine the extent of baking."

Conducting this simple test will aid in determining the proper time and temperatures to use for various cores in a given oven and under given atmospheric conditions.

While the chemical analysis test is conventional and quite definite, its relative importance will vary with the application of the casting. The foundry, therefore,

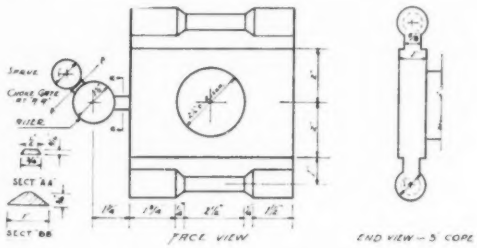


Fig. 7—Sketch of the 5/8-in. Web-Webbert tensile test bar.

should obtain its raw material from reputable sources and take steps to avoid contamination with harmful impurities in storage, handling, melting, casting, etc.

Laboratory Tests

Many a good foundry operates successfully without constantly checking the chemical analysis of the castings because in the modern high speed production foundry, the chemical results are obtained too late to be of any practical use. Many shop tests can be employed to maintain an almost constant quality.

There are exceptions where chemical analysis must be maintained. For example, in castings required to resist corrosion or to possess high conductivity, the chemical composition will generally be a predominating factor determining the suitability of the material. Where chemical analyses are necessary, detailed methods can be found in the aforementioned *Methods of Chemical Analysis of Metals*.

The mechanical tests usually associated with copper base foundry alloys are the tensile, impact and hardness tests. The properties that may be determined from the tensile tests are the yield strength, proof stress, elastic limit, modulus of elasticity, ultimate strength, per cent elongation and per cent reduction of area. Other mechanical tests that may be performed but

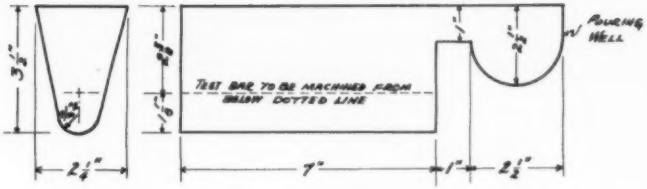


Fig. 8—Dimensional sketch of the medium V test bar. This type of test bar can be used for aluminum bronzes and high strength brasses.

are not used as often as the tests mentioned above are shear, torsion, fatigue and creep.

For determining these mechanical properties, some type of test bar is necessary and for means of comparison, a standard form of test bar should be adopted. A test bar similar to the design of that shown in Fig. 7 should be adopted as a standard tensile test bar for the copper base foundry alloys. Aluminum bronzes and high strength brasses could be cast into a test bar similar to that shown in Fig. 8 (see ASTM Designation B208-49T for recommended design of test bars).

Test Bars Indicate Properties

The function of a test bar is to provide, for inspection purposes, an indication of the properties which the metal poured is capable of giving and the control exercised in the foundry. The separately cast test bar, as illustrated in Figs. 7 and 8, is usually a simple form of casting which can be made substantially free from any deleterious features, such as shrinkage porosity and internal stresses, and may have a cross section larger or smaller than the casting and therefore differs in grain size and microstructure from the casting.

The test bar must be sensitive to the effect of dissolved gases—not always evident on some types of test bars commonly in use today. Furthermore, from the economic point of view, the form of test bar adopted as a standard should entail minimum wastage and machining time and yet provide adequate metal for obtaining a sound bar.

It should be strongly emphasized that the mechanical properties obtained from the separately cast test bars are not normally representative of the properties of the metal in the casting. The same reasoning may also hold for the "cast-on" test pieces. Several disadvantages exist for the "cast-on" test bars, e.g., their presence may cause local porosity in the casting at the line of junction and may interfere with the correct pouring temperature for the castings. In these ways the "cast-on" test bar may be detrimental to the casting itself and for these reasons, "cast-on" test bars should not be used.

Regardless of the type of test bar casting used, the finished or machined bar should correspond to the standard 0.505 in. diameter and 2 in. gage length with either threaded or plain ends. By the use of an extensometer, the stress-strain data may be either automatically or visually recorded and the yield strengths at 0.2 per cent or 0.5 per cent offset or 0.5 per cent elongation load and proof stress, elastic limit, proportional limit and modulus of elasticity may be determined.

From the test bar itself, the per cent reduction of area and of elongation are determined. The maximum load registered on the tensile machine divided by the original area of the bar is the ultimate or tensile strength of the material in the bar under test.

With steel, manganese bronze, aluminum bronze and other high tensile alloys, the separately cast test bar may more closely represent the actual casting than with brass and tin bronze. This is true because the former alloys have a much shorter freezing range resulting in a fine grain size—hence they encounter less variation due to pouring temperature. With the brasses and tin bronzes the opposite is true—they have a longer freezing range, which gives a large open structure, making them very susceptible to pouring temperatures employed in practice.

The standard test specimen now in use for making single blow impact tests of copper base foundry alloys is the Izod or cantilever beam impact specimen. However, no one type of specimen or test appears to be suitable to all the alloys, with the result that many different interpretations are obtained.

In some cases the impact test has shown considerable merit, while in others the results obtained have been of dubious value. One illustration of its merit is shown by comparing the impact resistances of various manganese bronzes at elevated temperatures.

Metallography

Metallography is essentially the study of the intrinsic characteristics of a metal or alloy in relation to its physical and mechanical properties. The irregularities brought out can best be used in the foundry when determining the best procedures to be used in setting up production methods. Metallographic techniques should be classed as laboratory tests and not as production tools. They can be divided into two general groups—microscopic and macroscopic examinations. Another classification that will be included here as a metallographic test is microradiography.

The importance of microscopic examination lies in the fact that many observed structures in the metal, such as grain size, the mode of occurrence and distribution of non-metallic inclusions, segregation and other heterogeneous conditions have a marked influence on the mechanical properties of the metal. The chief uses of microscopic examination of copper base foundry alloys are to check the microstructure with the temperatures used in heat treating the aluminum bronzes, the size, shape and distribution of lead in the leaded bronzes and microscopic porosity in the tin bronzes that was not apparent in the fracture test.

The extent and character of irregularities in a metal or alloy are best revealed by macroetching, followed by an examination of such irregularities with the unaided eye or at low magnifications, rarely exceeding 10 diameters. This is called macroscopic or macro-examination and is distinguished from microscopic

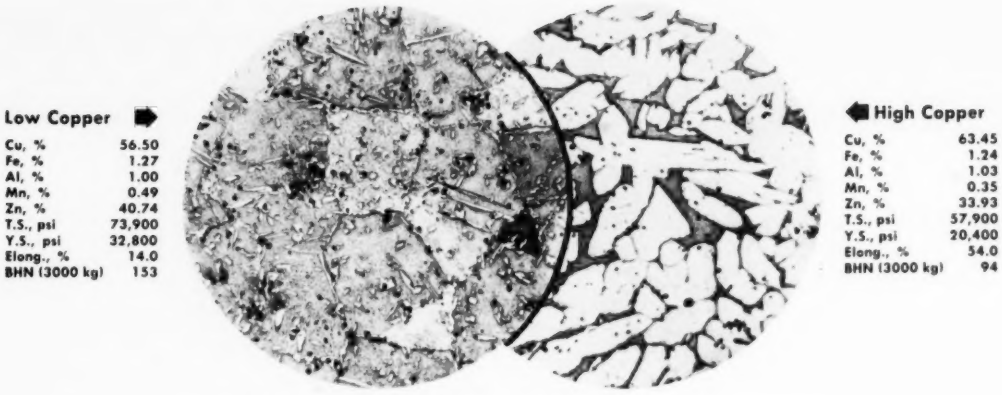


Fig. 9—Photomicrographs show effect of copper content on microstructure and mechanical properties of manganese bronze.

examination by the low magnifications used and by the fact that larger areas may be examined. Macroscopic examination is used to reveal grain size, dendritic formations, the direction of solidification, localized shrinkage, gas holes, cold shuts, and other discontinuities of the metal section being examined.

Microradiography does not merely look at a single surface but records discontinuities encountered by the x-rays as they pass through the thickness of the material. Effects produced by internal irregularities will be radiographically enhanced by a piling up of these conditions between the top and bottom of the specimen. This is the opposite of microscopic examination which only examines a two dimensional field.

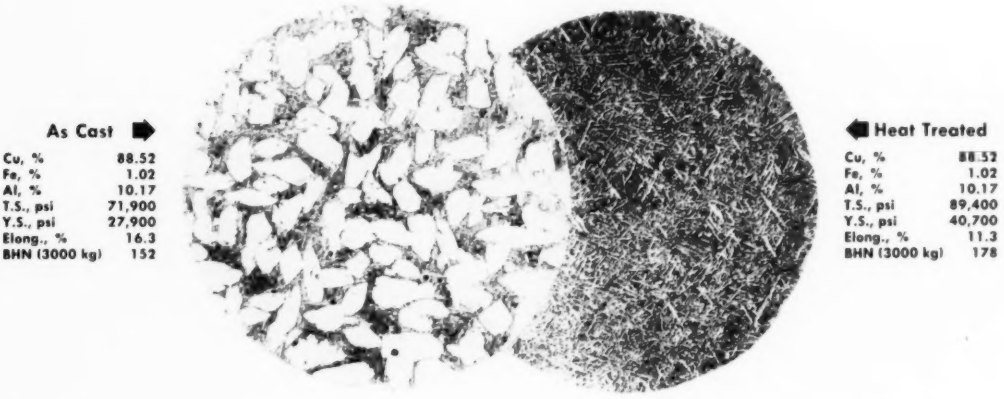
Because of the absence of etching and lapping which etch or pull out phases in the microstructure, and because the shapes of the undisturbed cavities below the surface are revealed, the x-ray method is superior to metallography for studying cavities up to 100 diameters. Microradiography can best be used on the non-ferrous foundry alloys for differentiating between lead and porosity in the leaded bronzes (sometimes difficult when using the regular microscopic examination), to reveal the segregation of impurities and the alloying elements and to identify defects.

Spectrographic Analysis

While the spectrograph is an important metallurgical tool, up to the present time it has found little usage in the brass foundry as a control unit. Most brass is melted in furnaces containing less than 1000 lb and the melting cycle is approximately one hour or less, of which over half of this time is actually consumed in getting the metal in a liquid state. This does not adapt itself readily to the use of the spectrograph, as the metal must be poured when ready, thus not allowing enough time for the actual sampling, preparation of same and actual analysis. The results would be too late for correction of off-analysis heats.

Most foundries melt charges of predetermined an-

Fig. 10—Effect of heat treatment on the microstructure and mechanical properties of 89-1-10 aluminum bronze.



alyses, such as refined ingots, returned gates and sprues, borings from their own castings and occasionally miscellaneous or "foreign" scrap, so that there is little possibility of not obtaining the proper composition in the finished castings. The volatile elements such as zinc, lead, etc., are replaced.

Another reason the spectrograph has limited use results from the large number of copper base alloys which are made today. Since the nature of the method of analysis is a comparative one, in that an unknown sample is measured in terms of a standard similar sample, the problem of preparing these standards and analytical curves becomes enormous.

The range of concentrations of the alloying constituents in copper base alloys may run from a mere trace to 40 per cent. Where the accuracy expected by the usual spectrographic methods of analysis (3 to 4 per cent variation), would be acceptable for concentrations below 2 per cent, this accuracy is insufficient for control work at the higher ranges encountered in most brasses and bronzes.

In the production of foundry ingot, where large furnace operation is general and where considerable contaminated scrap is used, the spectrograph is almost essential. This is thoroughly discussed in a paper, "*Spectrographic Analysis in the Manufacture of Brass and Bronze Ingots*," by G. E. Staahl and G. P. Halliwell, presented at the 1947 A.F.S. convention in Detroit, and published in TRANSACTIONS for that year.

Radiographic Inspection

Radiography can best be described as a means of actually looking through a metal casting and determining the presence of any internal or surface discontinuities, such as heterogeniety of the material, large surface cracks, localized shrinkage, general porosity, cold shuts, hot tears, gas holes, etc., without destroying the casting.

Radiographic inspection is based on the fact that x-rays or gamma rays will pass through a metal with more of the rays passing through the areas of discontinuities. Intensity of these rays is indicated on a fluorescent screen or sensitized photographic film.

Sectioning or fracturing has proven to be a valuable method of inspection for determining metal quality but radiography will show with certainty the presence, type, and extent of the defects without destroying the metal object. Therefore, the greatest advantage of radiographic examination is that every casting produced can be inspected and thus save the machining costs on those castings where defects may be discovered during or after machining.

The disadvantages of radiographic inspection are the high initial cost of the equipment and its upkeep and the lack of agreement in interpreting the radiographs of the brass and bronze alloys. Radiographic standards have been made for steel and aluminum alloys, but to date none has been obtained for the copper base sand casting alloys. "*Radiography of Gun Metal Castings*" by W. H. Baer (AMERICAN FOUNDRYMAN, April, 1947), is a good reference as to defects brought out by radiography in bronze alloys.

Of the heavy non-ferrous foundry alloys, only some of the nickel silvers, monel and nickel can be tested magnetically. A general magnetic testing procedure is used to detect the presence of internal or surface defects of a metal part, such as incipient fatigue cracks, seams, and shrinkage cracks in welds.

The specimen is magnetized by passing an electric current through it or by the influence of an external magnetic yoke. Small local poles are thus produced at the extreme edges of the defects, due to the magnetic field in the specimen. A finely divided paramagnetic material, such as iron dust, is spread on the specimen as a dry powder or suspended in light, fluid oil.

Wherever the local poles are set up, the iron powder will concentrate, showing the location and the general shape of the defects. The depth to which cracks may be detected depends on the material and the physical shape of the specimen.

Magnetic powder inspection is excellent on magnetic materials but cannot operate on the non-magnetic non-ferrous alloys. The fluorescent penetrant method

Fig. 11—Spectrographic analysis is used mainly in large furnace production of brass and bronze ingots.

is a practical means for indicating surface flaws on non-ferrous alloys with the speed and certainty necessary for production inspection.

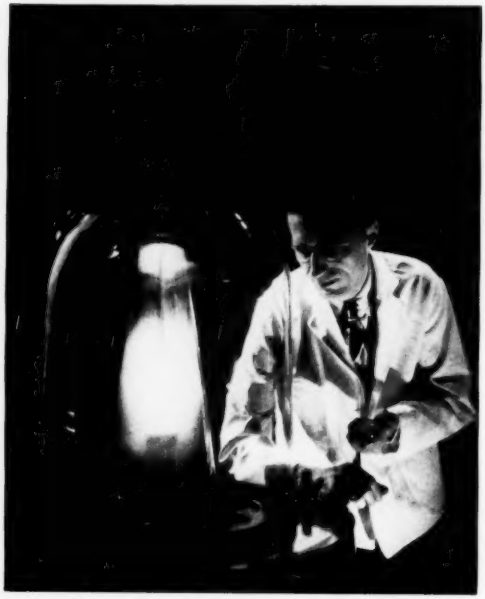
The principles of operation are first to coat the parts with a fluid that has the properties of penetration and fluorescence and is water soluble. Sufficient time is then permitted for the fluid to penetrate into the defect depending on the surface tightness of the flaw. The excess penetrant is then washed off the surface of the parts by a spray of warm or cool water. After they are dried, an absorbent developing powder is applied to the surface and the excess removed. This developing powder draws the penetrant back out of the flaws to the surface and reduces the fluorescence of the background.

The parts are then inspected under ultra violet light, which will reveal the surface flaws as bright, glowing indications to the observer. Shrinkage porosity and cracks, surface pinhole porosity, surface sand, slag inclusions, and cold shuts may be revealed by the fluorescent penetrant method. The sensitivity of the process depends upon the tightness of the surface opening of the defect and the time allowed for the penetration of the fluorescent material.

New Ionized Atom Process Etches Metals For Microscopic Examination

CATHODIC VACUUM ETCHING—a process never before used in industry—utilizes ionized atoms to prepare metal surfaces for microscopic examination. The process, developed by the Ford Motor Co., Dearborn, Mich., enables the taking of an unusually clear photograph of flow lines. With this method, the physical features of metal can be examined under a microscope and measured accurately as to their effect on strength and performance in parts in which the metal will ultimately become a fixture.

The new etching technique works this way—the metal sample is placed in a partial vacuum with



argon; then 12,000 volts of electricity are charged into the vacuum, creating argon ions which bombard the metal surface and knock off minute particles.

A pressure-rolled Ford front wheel spindle was examined experimentally by the usual microscopic technique. No superficial layer of flowed metal could be detected by the chemical etching process. However, cathodic bombardment etching revealed the entire superficially rolled structure, showing individual flow lines indicating that deformation was only .005 in. deep. Preliminary results have also been obtained which indicate that grain structure can be more clearly shown by cathodic bombardment, according to Ford engineers, who are exploring this phase.

A.F.S. Library Acquires New Volumes

LATEST ACQUISITIONS to the A.F.S. Headquarters Library, Chicago, are *Histoire de L'Usine des Vennes*, from Belgium, *Proceedings of the Institute of British Foundrymen* (1947-8) Volume XLI, and *Miscele Di Ghisa Nella Moderna Fonderia* (Gray Iron Mixtures in the Modern Foundry), from Italy.

Histoire de L'Usine des Vennes (History of the Venne Plant is a 381-page, paperbound volume issued on the occasion of the 400th anniversary of the birth of Belgium's oldest foundry. Profusely illustrated, this volume traces the technical and economic evolution of the historic cast iron pipe foundry from 1538 to 1948.

Proceedings of the Institute of British Foundrymen (1947-8), Vol. XLI, contains technical papers presented to the 45th General Meeting of the Institute, plus a selected number of papers presented to IBF branch meetings during the year.

Miscele Di Ghisa Nella Moderna Fonderia was written by Mario Olivo, Impiante Fonderie Olivo, Milan, Italy. Paperbound, its 242 pages are intended to help Italian foundry technicians make best use of Italian raw materials. The book is divided into three sections dealing with casting mixtures, melting processes, and rapid control methods.

Announce Air Pollution Symposium

NATION-WIDE ACTIVITY in the field of air pollution has stimulated Stanford Research Institute to sponsor a National Symposium on Air Pollution in cooperation with California Institute of Technology, the University of California, and the University of Southern California. To be held November 10 and 11, the symposium will take place at the Huntington Hotel, Pasadena, Calif.

The two-day symposium is expected to cover biological and medical effects, effect on visibility, meteorological aspects, methods of sampling and analysis, reduction or elimination of air pollution at its source, and influence of the various factors on industrial planning and plant location.

Submit 1950 Convention Papers Early

AUTHORS OF TECHNICAL PAPERS expected to be presented at the 54th Annual A.F.S. Foundry Congress and Show—Cleveland, May 8-12—should plan now to meet the December 15 deadline.

Papers in manuscript form should be sent in duplicate as soon as possible to the Technical Director, American Foundrymen's Society, 222 West Adams St., Chicago 6, Ill. Manuscripts will be forwarded to the appropriate committee for review and possible scheduling for the 1950 A.F.S. Convention.

Intent to submit a paper can be indicated on the Offer of Technical Paper forms available from the Technical Director. Copies of the A.F.S. GUIDE TO AUTHORS are available on request.

Acceptance of a paper for the Convention contemplates its publication as a preprint, its presentation at the Annual Meeting followed by publication in TRANSACTIONS. Some papers submitted may be published in AMERICAN FOUNDRYMAN.

MOLDING SAND STANDARDIZED

James J. Silk
Sand Technician
Taylor & Co.
Brooklyn, N.Y.

MORE THAN EVER BEFORE the need for complete control of every element in molding sand is apparent because of their contributing effects on the finished casting. The shape, size, and grain distribution of a sand, the percentages of impurities, clay content, moisture, sea coal or other carbonaceous ingredients and combustibles must be known if the best casting results are to be obtained.

One characteristic of a molding sand on which most authorities are in complete agreement is that a sand should be refractory. It must be high in silica and low in fusible contents. Now, that is a generalization, of which we have had too many in the past. To be more positive and definite, the author wishes to state that the safe limit of the combined impurities (lime, feldspars, hornblende, micas, iron oxide, etc.) should not exceed 2 per cent. To secure this desirable condition we must wash and dry the sand; hence, natural sand is immediately excluded from the picture.

Sand Grain Shape Is Important Factor

After refractoriness, the next property to consider is grain shape, and here the author wishes to concur in Moldenke's selection of a rounded grain in preference to angular, sub-angular or compound grain structures. Moldenke's choice was influenced by the better flowability of rounded grains; the author's by other considerations.

The ability of a rounded sand grain to withstand thermal shock and consequent penetration by the radiant heat of molten iron, along with disastrous erosion, is due to the fact that it presents less surface area to the mold face and is less exposed to the tearing action of the molten metal. If rounded-grain sand is adequately protected from the penetrating heat by some form of carbon insulation, and cushioned with a proper clay to endure the action of corrosive gases, it should be the most durable and economical sand in the foundry.

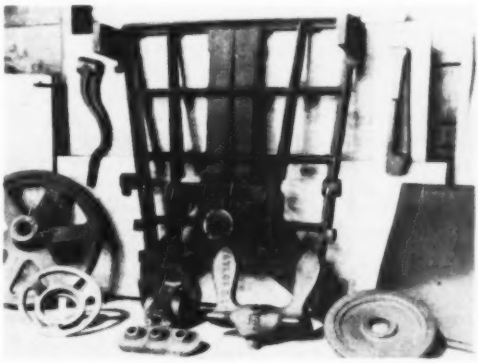
A rounded grain of sand is usually the purest form of silica. It is the result of a natural geological process involving the cleansing action of the winds and tides of many generations, assisted too by periodic glacial movements which finally caused it to shed attached or combined but more soluble ingredients until it ultimately became safely isolated in the various strata of the earth's crust. Angular or other shaped sand grains are probably an illustration of a case of arrested development in this same geological phenomena. A compound grain is an even better example of an incomplete and stunted product.

Flowability Influenced by Grain Shape

The flowability of a molding sand is influenced by the shape of its grains more than by any other factor. A rounded grain offers less frictional resistance to neighboring grains, and therefore to the ramming energy necessary to compress it to the proper degree of mold hardness without risk of expansion difficulties. This property makes it particularly adaptable to machine molding wherein the jolting and squeezing can be regulated.

Expansion troubles can be minimized and casting finish improved by maintaining a grain distribution over seven adjacent screens. If the sand temporarily becomes too uniform, it can be relieved by additions of wood flour or corn flour up to one per cent.

If any one doubts this let him try to make a satisfactory gray iron casting in a sand with a A.F.A. Fineness Number of 200. No matter how well it is insulated by carbonaceous elements either in the direct mold-face application or indirectly in the facing itself, or cemented by any clay additives or other binders it will probably wash, buckle, swell, scab or blow. A small grain of sand evidently cannot endure prolonged exposure to the radiant heat without disintegrating and creating fines in the facing which, while a certain limited percentage can be tolerated, serve no useful purpose and shorten the life of the sand heap.



Typical castings produced in the jobbing shop are (center) a linotype magazine frame, restaurant grill (right), bland gears, anchor, levers, etc. Good finish is obtained by close control of the molding sand.

In a mechanized system such as in this jobbing foundry, all molding sand must be considered facing sand as it is all collected and stored in the central hopper, and all sea coal and clay additions, computed by weight, are made at the mixer.

For general jobbing work involving castings from 3/16 to 6 in. in wall thickness, the author finds the following grain distribution to be most satisfactory: 30 per cent retained on the 100 sieve; 20 per cent retained on both the 70 and 140 sieve, 10 per cent on both the 50 and 200 sieve; and 5 per cent on both the 40 and 270 sieve; A.F.S. Fineness Number about 80.

It is an accepted fact that moisture and clay are necessary evils in a molding sand, and so is sea coal. Therefore, the minimum safe limits of these three

important ingredients should be closely observed and jealously governed. Sea coal and clay should be chosen for their respective purities and corelated with their economical aspects.

Since the purest form of clay in America appears to be the bentonites (both southern and western) these should be used whenever the shipping costs are not prohibitive.

The author has found that almost any green or dry strength can be obtained in a molding sand by blending the two clays. The total clay percentage should average about 5 per cent.

Proportion Sea Coal to Section Thickness

Sea coal has some objectionable features, but so far no one has come forward with a more controllable substitute. Much research work has been done, and it is the author's belief that in time this situation will be changed. Until a satisfactory substitute is found, let us stabilize the proportion of sea coal to a particular casting thickness, thereby maintaining some standards by which we can achieve the utmost in casting quality.

In the author's experience the percentage of sea coal should be as follows: for small castings 3/16 to ¼ in. thick, 6 per cent; ¼ to ⅝ in. thick, 8 per cent; ⅝ to 1½ in., 10 per cent; 1½ to 2½ in. thick, 12½ per cent; 2½ in. up, 15 per cent. However, it is well to remember that the grade of sea coal should be also proportioned according to the thickness of the casting, and that its total content should not exceed 15 per cent even on heavy sections because of resulting ash contamination of the general sand. Direct applications of plumbago on the mold face will better supply the deficiency.

Fine seal coal flashes quickly and deposits a film of carbon between the mold face and the casting, blending with a fine sand evenly, cushioning the voids and creating an unbroken surface for the metal to lie against. Fine sea coal should be employed for small work. Heavier castings require a coarser grade, since the mold takes longer to fill and the permeability of the sand is more favorably affected by the coarser substance.

Since each property of a molding sand is interconnected with every other property, it is essential that they be closely controlled and a daily check taken to maintain them.

In the author's experience the ideal permeability of a sand is 70. At first glance this appears to be rather high for the general run of castings, but after further consideration it will be found that in a jobbing foundry where sectionalizing is not practiced the wisest course would be to prepare the sand to favorably receive the larger work where a blow-back might occur if the sand were too tight.

Provide Adequate Venting

It must always be remembered that the presence of cores in a mold constitutes an additional threat as a "gas contributor" and must be provided for no matter how well vented they may be. Steam from the moisture in the molding sand as well as gases from cores and sea coal must have ready egress to the atmosphere. In some of the large automotive foundries the bottom boards and flasks are perforated to better assist gas escape.

The safe maximum limit for water is 4 per cent; however, the author has found the better practice to be around 3.5 per cent and has successfully cast in sand with moisture as low as 2.8 per cent without any indication of cuts and washing. The guiding percentage will depend principally on when the mold is poured in any particular operation, and also on its length of travel to the pouring station. Excessive moisture leads to high mold hardness, with its accompanying evils.

Since no sand supplier has a sand with the exact grain distribution that the author advocates, the best way to achieve it is by blending two or more sands of known grain size. Most sand suppliers are cooperative in these matters and exercise close control over their sand deposits in order to satisfy every molding need of the foundry.

If the sand becomes too uniform at any time, expansion stresses can be relieved by additions of wood flour in small percentages, one per cent being the safe limit. However if this is not possible, as a temporary expedient the mold hardness can be lowered to a reading of 40 until the sand grain distribution has again been stabilized. The casting finish must be adversely affected during this transition.

Check Sand Periodically

In our operation the molding sand is checked in the morning and afternoon. Green permeability is maintained at 60 to 70, moisture at 3.5 to 4 per cent, and green compressive strength at 7½ psi. Mold hardness averages about 60 for most jobs, with a good casting finish being obtained.

A typical mixture having the foregoing properties would be somewhat like the following: 88 per cent New Jersey silica sand; 3½ per cent western bentonite; ½ per cent southern bentonite; and 8 per cent sea coal. The moisture content would be approximately 3½ per cent by weight, and the A.F.A. Fineness Number about 80.

This sand is highly refractory and very durable if the sea coal content is proportioned with respect to the casting thickness, little thermal breakdown of the sand grains occuring if the proper control is exercised. Sea coal residue or ash contamination is limited also by proper combustion and proper distribution of this volatile element.

The mulling cycle is 2½ min., of which 1 min. is dry mulling and 1½ min. with the water addition. However, it is evident that the longer the mulling cycle the more economical the operation will be in so far as necessary additions of clay, sea coal, etc., are required. The batch of sand weighs 2500 lb.

Sea coal is provided in three grades. The selection of this element should be comparable to the fineness number of the sand so that it will be evenly distributed through the heap quickly and with a minimum sacrifice of permeability. The supplier of this substance should have a reputation for the purity of his product.

To control the various ingredients that go into the making of a satisfactory all-purpose sand for a jobbing shop is not an easy task. The sand technician should be carefully chosen for his ability to understand the demands for a sand to suit a particular casting. These things can be better handled by visiting the foundry

and observing the behavior of the sand under actual operating conditions.

Wherever possible, the molders should be grouped according to casting sizes. This will provide for easy delivery of the proper amount of sea coal in the mix, and lessen the chance of burning the sand. The core-room should be advised to regulate the fineness of the core sand to conform to the grain distribution in the system. The shakeout should be watched to avoid lumping of sand and a consequent longer mulling cycle. The amount of southern bentonite should be increased until this condition is alleviated. Molding groups should be checked to see that the sand is not tampered with after delivery.

NOTE ON DONALDSON'S METHOD FOR DETERMINING COMBINED CARBON IN MALLEABLE IRON

H. A. Schwartz and G. M. Guiler

**National Malleable & Steel Castings Co.
Cleveland**

DIFFICULTY OF DETERMINING total carbon and graphite in malleable iron (both relatively large numbers) each with sufficient accuracy so that their difference is a reliable indicator of combined carbon has always occasioned thought.

J. G. Donaldson described a direct method for determining combined carbon under the title *"Direct Determination of Combined Carbon in Cast Iron and Steel"* in A.F.S. TRANSACTIONS for 1942, page 931, which held great promise of utility for the determination of small amounts of combined carbon in malleable iron.

We have never had occasion to suspect the accuracy of the Donaldson method in any work which we have done with cast iron or steel but in the analysis of malleable iron the determination of combined carbon proved unreliable. The results on samples containing metallographically no cementite, were sometimes as high as 0.34 per cent, although in such cases the combined carbon by difference was smaller than the error of the determination.

The difficulty was first encountered in samples which, for other reasons, were obtained by filing a cross section. Changing to the use of turnings produced fewer eccentricities but did not entirely overcome the likelihood of completely erratic and erroneous results.

Investigation disclosed that the residue of graphite in the Donaldson method always weighed less than it should have as compared with graphite determination made by the conventional method of solution in nitric acid, in those cases in which the combined carbon was high. It was concluded that the difficulty lay in an attack by the reagents on the graphitic carbon.

Graphite determinations, using Donaldson's solvent, always gave results interchangeable with those using nitric acid. The loss of graphite occurred after the addition of ammonium persulphate. Obviously the solution of the problem is to remove the graphite before the addition of the persulphate and the following procedure was developed:

Proceed as described by Donaldson until solution is complete. Flush with oxygen for 3 min. Remove the solution flask and filter out the temper carbon using asbestos in Gooch crucible. Wash twice with 1 to 1 H_2SO_4, once with water, then twice with hot 10 per cent NaOH solution and finally once with water. It is important in the procedure that the volume of the filtrate be kept as small as possible at all times.

Return the filtrate to the solution flask and attach the flask to the carbon train. Add the ammonium persulphate solution and finish the determination as in the original method.

This additional precaution adds somewhat to the length of the determination but so far has always given results interchangeable with the orthodox methods. Its use renders the Donaldson operation very convenient where the determination of a small amount of combined carbon in the presence of considerable graphite is required.

The sodium hydroxide solution is used to remove organic compounds which adsorbed by the finely divided graphite. It is not desired to attempt any explanation here as to the cause of the difficulty, which may be due either to the friable character of temper carbon or to its greater chemical activity.

Announce Appointments To Foundry Advisory Technical Subcommittee

Newly-appointed to the Foundry Industry Advisory Technical Subcommittee by the United States Munitions Board are the following prominent foundrymen and metallurgists:

Chairman Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va.; George J. Behrendt, Eastern Malleable Iron Co., Naugatuck, Conn.; Charles W. Briggs, Steel Founders' Society of America; Charles O. Burgess, Gray Iron Founders' Society; S. C. Massari, Technical Director, American Foundrymen's Society.

Thomas E. Eagan, Cooper-Bessemer Corp., Grove City, Pa.; Walter W. Edens, Badger Brass & Aluminum Foundry, Milwaukee; Richard A. Flinn, Jr., American Brake Shoe Co., Mahwah, N. J.; Roy A. Gezelius, General Steel Castings Corp., Eddystone, Pa.; J. W. Juppenlatz, Lebanon Steel Foundry, Lebanon, Pa.

James H. Lansing, Malleable Founders' Society, Cleveland; Carl F. Lauenstein, Link-Belt Co., Indianapolis; G. A. Lillieqvist, American Steel Foundries, East Chicago, Ind.; Charles E. Nelson, Dow Chemical Co., Midland, Mich.; Donald J. Reese, International Nickel Co., New York.

John S. Roberts, American Manganese Bronze Co., Philadelphia; Howard J. Rowe, Aluminum Co. of America; Harry St. John, The Crane Co., Chicago; A. E. Schuh, U. S. Pipe & Foundry Co., Burlington, N. J.; Gosta Vennerholm, Ford Motor Co., Dearborn, Mich.; and R. E. Ward, Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J.

Lt. Col. F. H. Holmes, USAF Materials Resources, will act as liason officer to the Munitions Board.

MODERN FOUNDRY METHODS...

Most modern and unusual variation of the ancient lost-wax process of producing castings with fine detail and close dimensional control uses a frozen mercury pattern instead of the traditional wax. Producing precision castings of complex form with dimensional tolerances of plus or minus 0.003 in. in 1 ½ in. are common in this process used by the Sperry Gyroscope Co., Great Neck, N. Y. Bulk of the castings produced have been of aluminum-silicon alloy; some stainless steel and coin silver castings have been made. The three-piece mold, the bottle of mercury, and the multi-cavity investment (above) illustrate the essential elements of the facilities needed to produce the small aluminum alloy casting in the center of the group (upper left). Basic steps in process start with forming a mercury pattern in a steel mold. Frozen solid, the mercury pattern

Assembled mold previously filled with acetone receives mercury which will form the pattern when frozen.

Solid mercury precision patterns are easily removed from mold after a few minutes freezing. Mercury-filled molds are frozen in dry-iced methylene chloride at —60 C.

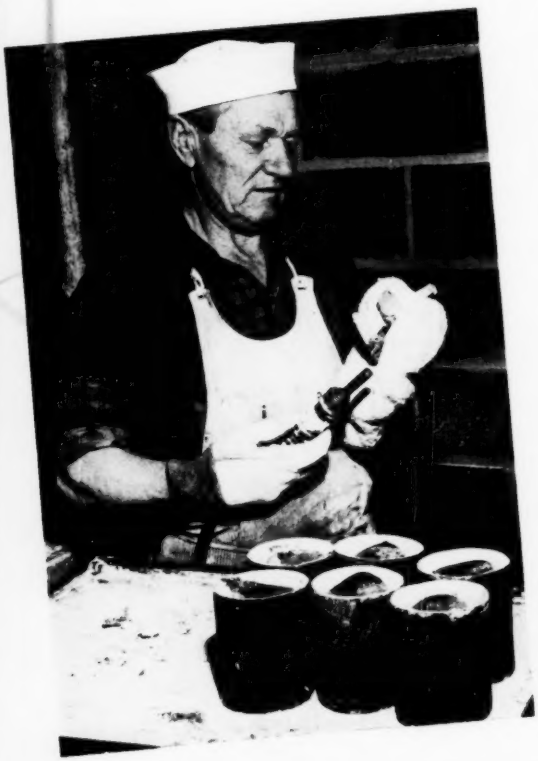
...MODERN FOUNDRY METHODS

is dipped into a refractory mixture which becomes the precision mold after drying and after the frozen mercury has melted and run out. Molds used are similar to those in which injection molded wax patterns are made but shrinkage allowance is different and a regular sprue, as in a permanent mold, is used. First step after assembling the mold is to fill with acetone which displaces air and lubricates the mold walls. The heavy mercury which follows fills the mold completely, displacing the acetone. Patterns are frozen in the mold with a bent wire rod placed in the sprue to provide for subsequent handling. The refrigerator is kept at —60 C (—76 F) by means of dry ice. Specially constructed, the ice box is heavily insulated with cork. Nearly submerged in liquid methylene chloride at —60 C, the mercury freezes in a few minutes. The frozen pattern is removed from the mold

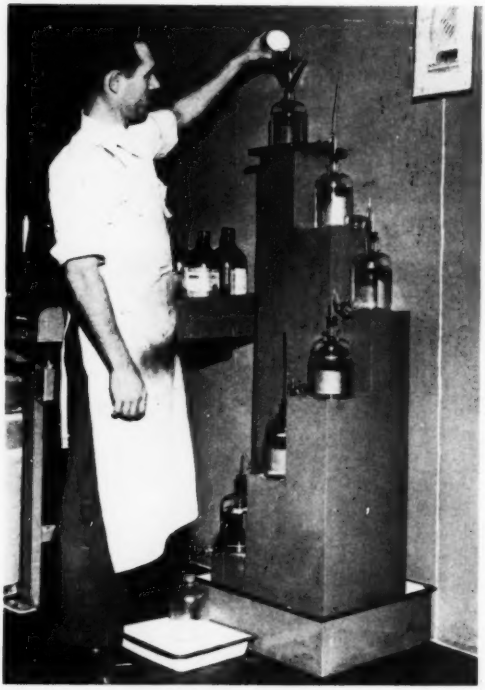
and dipped in a cold refractory mix and hung up to dry at —60 C. Approximately 10 dips are required to build up the mold. After drying in the ice box, the refractory molds are cut open and laid on a table at room temperature to allow the mercury to melt and run out. A special table (upper right) slopes toward a hole in the middle through which the mercury runs for collection and reclaiming. Air ducts at the sides of the table carry away any possible mercury vapor that may exist. Cold dried refractory molds, free of mercury, are dried further in an oven and are subsequently fired in a high temperature kiln. From the high temperature firing through the rest of the process, operations and equipment are essentially the same as in the usual precision investment casting process and the same equipment is used. Dry refractory molds are placed in cylindrical flasks and packed with a backing mixture. Completed molds are poured centrifugally, either singly or in groups of four.

MODERN FOUNDRY METHODS...

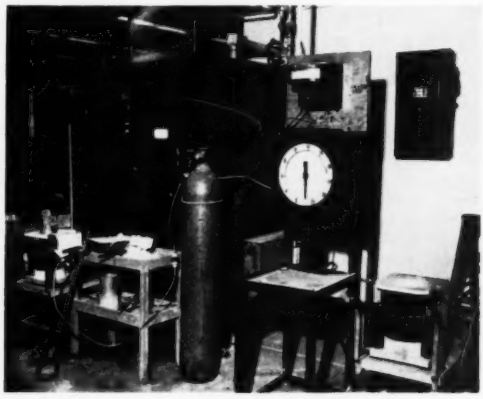
In the illustration above, the operator is removing one of four molds poured together centrifugally with a common sprue in the center. Castings are knocked out (below) by a small air hammer which also loosens the investment material. Adhering investment material is softened by soaking in water. Subsequent cleaning operations—sawing gates, blasting—are the same as in any foundry cleaning room.



Mercury cleaning rig removes foreign matter so mercury can be re-used. Various bottles contain nitric acid, sodium hydroxide solution, and distilled water. Mercury is washed in a single continuous run.



High frequency induction furnaces used to melt alloys raises them to pouring temperature within a few minutes. Melting room is free of smoke and fumes.



BUY PATTERN EQUIPMENT ON SPECIFICATION

G. L. Hartman
Vice-President & General Manager
Mi.waukee Flush Valve Co.
Milwaukee

IN THE PURCHASING OF PATTERNS the writer has followed the principle of putting in writing exactly what the pattern maker is expected to furnish. This practice serves as a basis for inspection, and eventually builds up a standardized program of pattern construction best suited to the needs of the purchaser and the producing foundry.

Specifications for pattern construction should be written after consultation with the designing engineer, the pattern maker, and the foundryman in order to arrive at workable pattern equipment.

The next step of the pattern purchaser is to submit such specifications to pattern makers for quotations, inviting bids from only such pattern makers who could produce a suitable pattern and to whom he would let the contract. It is unfair to allow a pattern maker to spend time and money preparing a bid if he would not be given the job regardless of his bid. This does not build confidence. In the buying of patterns, confidence and trust must be developed—there are too many ways in which short cuts or cheap construction may be concealed under shellac.

Probably the simplest of all patterns is the tool pattern or patterns required for experimental parts. As a rule such patterns are built as cheaply as possible because only one casting is required and the pattern may then be discarded. Usually the tool designer simplifies the design to eliminate pockets which require coring, small holes are cast solid, straight lines are used wherever possible to simplify parting lines, and other economies are made to help reduce the cost.

Preparing Specifications

Specifications for such a pattern are fairly simple. The blueprint is marked in colored pencil, specifying the parting line, indicating the part to be made in the drag, finish to be allowed on machined surfaces, etc. A specification sheet describes the class of pattern desired such as white pine, whether glued or nailed, whether bosses and core prints are to be glued or nailed, the type of fillets (if any), the type of finish (usually one coat of shellac), the numbering and lettering required and other pertinent facts which will allow the pattern maker to quote intelligently. If more than one quotation is desired, all pattern makers will be able to quote according to the same specifications.

The next step up is a wood pattern for relatively small quantities required intermittently. Loose or mounted patterns must be made strong enough and sound enough to withstand fairly rough usage in the foundry and long storage in the pattern vault. Pattern finishes are important to avoid early deterioration. Where larger quantities are ordered at one time such equipment may well be mounted on a board if the casting can be made in the drag, or mounted on cope and drag boards if the pattern is large and production warrants such construction. If there is a possibility of excessive wear on some surfaces, such surfaces may be lined with metal. In general, the specifications are more detailed and more exacting the more complicated the design becomes. The ultimate is reached in automotive patterns, where combination hardwood and metal or all metal patterns are used.

Special designs frequently are adaptations of a standard design which allow the use of standard patterns with slight changes such as loose pieces added either to the pattern or core box or both, possibly a new core box with the standard pattern, or the use of inserts to increase the total length of a pattern. Such procedures require careful descriptions of the work to be done as well as the proper marking of the component parts of the pattern.

Some manufacturers require large quantities of small castings. Gated patterns are used to some extent, but patterns mounted on a plate or cast plates are most popular. This is a field in itself and requires a technique somewhat different than that of wood patterns. The procedure varies considerably. Here it becomes necessary and desirable to issue specifications for the master pattern, master core box and master drier pattern covering shrinkage, allowance for finish, size of plate, location on plate, number of patterns on the plate, layout of runners, gate and sprues, mounting connections, etc.

Problems of preparing specifications for pattern equipment have been mentioned only briefly. The conditions which apply in individual plants must be determined and can be standardized either through the preparation of basic specifications to apply to all patterns, or the use of such basic specifications with such variations as the various types of pattern equipment dictate. The preparation and use of pattern specifications are matters of observation and experience, particularly so if the buyer does not have the benefit of pattern-making experience or has not worked in a foundry. Nevertheless, such knowledge can be acquired by the pattern purchaser.

NOTE: This paper was presented at a session of the Wisconsin Regional Foundry Conference sponsored by the Wisconsin Chapter of A.F.S., at Milwaukee.

WANTED!
SPEAKERS FOR WESTERN CHAPTERS
Qualified, experienced speakers on any foundry subject will be welcomed by A.F.S. Chapters west of the Mississippi River—British Columbia (Vancouver), Mo-Kan (Kansas City, Mo.), Northern California (San Francisco), Oregon (Portland), Southern California (Los Angeles), Texas (Houston), Timberline (Denver), Tri-State (Tulsa), and Washington (Seattle). Any speaker planning a Western trip during the fiscal year 1949-50 is invited to communicate with the Technical Director, American Foundrymen's Society, 222 West Adams St., Chicago 6, if interested. The Technical Director will clear the offer with Western Chapters having open dates.

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Secretary—Daniel E. Krause, Exec. Dir., Gray Iron Research Institute, 1532 Cardiff Road, Columbus.

Treasurer—E. M. Durstine, Mgr., Keener Sand & Clay Co., 515 Hartman Bldg., Columbus.

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C. Wm. Gilchrist, Asst. Fdry. Supt., Cooper-Bessemer Corp. (Mail: 41 Mansfield Ave., Mt. Vernon, Ohio.)

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J. Howard Morgan, Gen. Mgr., Cedar Height Clay and Coal Co., Oak Hill, Ohio.

D. C. Williams, Asst. Prof., Dept. of Industrial Engrg., Ohio State University, Columbus.

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Directors—Terms Expire 1951

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F. W. Dixon, V.P. & Gen. Mgr., Haven Malleable Castings Co., Dane & Knowlton Sts., Cincinnati.

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Clifford Morningstar, Asst. Fdry. Supt., Black-Clawson Co., (Mail: 818 Ridgelawn Ave., Hamilton, Ohio.)

H. F. McFarlin, Supt., Carthage Works—Lunkenheimer Co. (Mail: 3623 Shaw Ave., Cincinnati.)

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Alfred W. Schneble, Jr., Plant Mgr., The Advance Fdry. Co., 107 Seminary Ave., Dayton.

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John M. Jones, Fdry. Met., American Locomotive Co. (Mail: 1192 Parkwood Blvd., Schenectady, N.Y.)

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Howard E. Voit, Slsmn., Sterling Wheelbarrow Co., 25 W. 43rd St., New York 18.

Walter Hartl, Treas., American Aluminum Casting Co., Irvington, N.J.

Wm. H. Ruten, Assoc. Prof., Indus. Processes Dept., Polytechnic Institute of Brooklyn, 85 Livingston St., Brooklyn 2, N.Y.

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Secretary-Treasurer—N. S. Covacevich, Apartado Postal 1030 Mexico, D.F.

Directors

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Delbert Luper, Luz Savinon No. 1211, Apartamento 32, Mexico, D.F.

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Directors—Terms Expire 1950

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Directors—Terms Expire 1950 Continued

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Andrew Peterson, Mall. Fmn. Chg. of Melting, Oliver Corp. (Mail: Route 4, Box 640, South Bend, Ind.)

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Alan G. Linley, Chem. Engr., Locomotive Finished Material Co. (Mail: 620 N. Third, Atchison, Kan.)

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John Schneider, Cleveland Electric Illuminating Co., Cleveland.

John M. Urban, Fdry. Supt., Fanner Mfg. Co. (Mail: 2000 Cypress Ave., Cleveland.)

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Maurice F. Degley, Engr., Ferro Machine & Foundry Co., 3155 E. 66th St., Cleveland.

Lloyd W. Leeseberg, Supr., Superior Foundry, Inc. (Mail: 3671 W. 148th St., Cleveland.)

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(Continued on following page)

NORTHEASTERN OHIO (continued)

Directors—Terms Expire 1952

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Howard E. Heyl, Sales, The Federal Foundry Supply Co., 4600 E. 71st, Cleveland.

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Milton Oakes, Asst. Fdry. Frmn., American Manganese Steel Div. (Mail: 1538 76th Ave., Oakland, Calif.)

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Treasurer—J. Rundquist, Co-Owner, Beloit Casting Co. Beloit, Wis.

Directors—Terms Expire 1950

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Robert Pottinger, V.P., Arnold Engineering Co., Marengo, Ill.

Directors—Terms Expire 1951

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L. K. Greenberg, Treas., Rockford Brass Works, Rockford, Ill.

Directors—Terms Expire 1952

H. J. Bauman, Beloit Iron Works (Mail: 2319 Elm St., Rockford, Ill.)

Martin Putz, Fdry. Supt., Fairbanks Morse & Co., Freeport, Ill.

Chas. N. Deubner, Fdry. Supt., Yates American Machine Co., Beloit, Wis.

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Vice-Chairman—Frank P. Volgstadt, Fdry. Supt., Griswold Mfg. Co., Erie, Pa.

Secretary—Earl M. Strick, Fin. Supt., Erie Malleable Iron Co. (Mail: 629 Beverly Drive, Erie, Pa.)

Treasurer—Fred J. S. Carlson, Fdry. Frmn., Weil-McLain Co. (Mail: 1136 E. 8th St., Erie, Pa.)

Directors—Terms Expire 1950

Roy A. Loder, Chief Inspector, Erie Malleable Iron Co. (Mail: 1014 Cherry St., Erie, Pa.)

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Bailey D. Herrington, Serv. Tech., Hickman, Williams & Co. (Mail: 312 Euclid Ave., Erie, Pa.)

Joseph S. Hornstein, V.P. & Gen. Mgr., Meadville Malleable Iron Co., Meadville, Pa.

Directors—Terms Expire 1951

Clyde E. Cooper, Fdry. Supt., Keystone Brass Works (Mail: 1314 Powell Ave., Erie, Pa.)

H. G. Lolley, Fdry. Supt., Bucyrus Erie Co. Drawer 800, Erie.

J. Marcus Morrison, Fdry. Supt., U.S. Radiator Corp. (Mail: 109 Temple, Fredonia, N.Y.)

Directors—Terms Expire 1952

Chas. F. Gottschalk, Vice-Pres., Cascade Foundry Co., 1902 Plum St., Erie, Pa.

W. H. Piper, Fdry. Supt., Erie Bronze Co., Erie, Pa.

C. C. Hahn, Fdry. Supt., National Transit Pump Co. (Mail: Box 48, Seneca, Pa.)

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Vice-Chairman—M. N. Tallman, A. H. Tallman Bronze Co. Ltd., Cavell Ave., Hamilton, Ont.

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Directors—Terms Expire 1950

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Reginald Williams, Supt. of Fdries., Canadian Westinghouse Co. Ltd., (Mail: 69 Paisley Ave., S. Hamilton, Ont.)

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J. Richardson, Sls. Mgr., United Smelting & Refining Co., 363 Wellington St., N., Hamilton, Ont.

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Chas. Johnston, Fdry. Supt., E. Long Ltd., 100 Front St., S. Orillia, Ont.

Alex Pirrie, Gurney Foundry Co., Ltd., 4 Junction Rd., Toronto, Ont.

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Secretary-Treasurer—Harry K. McAllister, Patt. Shop Frmn., Western Foundry Co. (Mail: 627 S. E. 71st Ave., Portland 16.)

Directors—Terms Expire 1950

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Lee E. Holcomb, Asst. to Supt., Crawford & Doherty Foundry Co., 4604 S. E. 17th Ave., Portland.

Harry K. McAllister, Patt. Shop Frmn., Western Foundry Co. (Mail: 627 S. E. 71st Ave., Portland 16.)

Directors—Terms Expire 1951

Harold A. Story, Supt., Oregon Brass Works, 1127 S. E. 10th Ave., Portland 14.

George C. Vann, Asst. Mgr., N. W. Fdry. & Furnace Co. 2345 S. E. Gladstone, Portland 2.

C. Neal Wilcox, Asst. Fdry. Supt., Electric Steel Foundry Co. 2141 N. W. 25th Ave., Portland 10.

Directors—Terms Expire 1952

E. J. Hyche, Vice-Pres., Rich Mfg. Co. (Mail: 1243 N. Russett, Portland.)

James T. Brodigan, Mgr., Columbia Steel Foundry (Mail: 2325 N. E. 53rd Ave., Portland 13.)

Hugh Templeton, Slsmn., Balfour-Guthrie Co., 733 S. W. Oak, Portland 7.

PHILADELPHIA CHAPTER

Chairman—William Morley, Fdry. Mgr., Link Belt Co., Olney Fdry. Div., 180 W. Duncannon Ave., Philadelphia.

Vice-Chairman—Clyde B. Jenni, Met., General Steel Castings Corp. (Mail: 205 Du Pont St., Ridley Park, Pa.)

Secretary-Treasurer—W. B. Coleman, Pres., W. B. Coleman & Co., 9th St. & Rising Sun Ave., Philadelphia 40.

Directors—Terms Expire 1950

W. B. Wilkins, Pres. & Gen. Mgr., American Manganese Bronze Co., Rhawn & Hergerman Sts., Philadelphia.

C. Louis Lane, Met., Florence Pipe Foundry & Machine Co., Florence, N.J.

H. P. Good, Supt., Textile Machine Works, P. O. Box 1382, Reading, Pa.

Directors—Terms Expire 1951

J. L. Furey, P. O. Box 5, Cheltenham, Pa.

Geo. H. Bradshaw, Master Molder, Philadelphia Navy Yard, (Mail: 1525 S. Walton St., Philadelphia.)

Directors—Terms Expire 1952

A. Kraft, Fdry. Mgr., Wilkening Mfg. Co., 2000 S. 71st St., Philadelphia.

C. R. Tinsley, U. S. Pipe & Foundry Co., Burlington, N.J.

QUAD CITY CHAPTER

Chairman—E. P. Closen, Gen. Frmn., John Deere Planter Works, Moline, Ill.

Vice-Chairman—Harold A. Rasmussen, Pres., General Pattern Corp. (Mail: 1931 34th St., Moline, Ill.)

Secretary-Treasurer—C. R. Marthens, Owner, Marthens Company, 309½ 16th St., Moline, Ill.

Directors—Terms Expire 1950

William C. Bell, Prod. Engr., Frank Fdries. Corp. (Mail: 1517 35th St., Rock Island, Ill.)

Robert Hendry, Patt. Supt., J. I. Case Co. (Mail: 1540½ State St., Bettendorf, Iowa)

H. L. Mead, Gen. Fdry. Frmn., John Deere Harvester Works, East Moline, Ill.

Martin H. Liedtke, Fdry. Supt., Farmall Works, International Harvester Co. (Mail: 2446 27th St., Moline, Ill.)

A. A. Zuber, Supt., Carver Pump Co., Muscatine, Iowa.

Directors—Terms Expire 1951

C. S. Humphrey, Pres., C. S. Humphrey Co., 249 2nd St., Moline, Ill.

A. D. Matheson, Plant Mgr., French & Hecht Div., Kelsey-Hayes Wheel Co., Davenport, Iowa.

J. H. Nelsen, Supt., Mississippi Foundry Corp., 1700 First St., Rock Island, Ill.

Directors—Terms Expire 1952

Boyd L. Hayes, Mgr., Union Malleable Iron Works, East Moline, Ill.

Russell H. Swartz, Gen. Mgr., Riverside Foundry Corp., Bettendorf, Iowa.

P. E. Wright, Fdry. Supt., Fairbanks, Morse & Co., 11th & 14th Ave., East Moline, Ill.

ROCHESTER CHAPTER

President—Herman G. Hetzler, Pres., Hetzler Foundries, Inc., P. O. Box 302, Rochester 1, N.Y.

Vice-President—Kenneth R. Proud, Fdry. Mgr., Anstice Co., Inc., 111 Humboldt St., Rochester, N.Y.

Secretary-Treasurer—Leon C. Kimpal, Engr., Rochester Gas & Elec. Corp., 89 East Ave., Rochester 4, N.Y.

Directors—Terms Expire 1950

Fred E. Adsit, Patt. Frmn., Ingersoll Rand Co., Painted Post, N.Y.

Charles E. Vaughn, Supt. of Fdries., Ritter Co., Inc., P. O. Box 848, Rochester 3, N.Y.

Max T. Ganzauge, Fdry. Supt., General Railway Signal Co., West Ave., Rochester, N.Y.

Directors—Terms Expire 1951

Wm. B. Richter, Fdry. Frmn., Gleason Works, 1000 University Ave., Rochester 3, N.Y.

F. J. Gehron, Supt., Southern Wheel Div., American Brake Shoe Co., 82 Barnum St., Rochester 9, N.Y.

Edw. J. Baker, Branch Mgr., Federated Metals Div., American Smelting & Refining Co., 16 State St., Rochester, N.Y.

Directors—Terms Expire 1952

Donald E. Webster, Met., American Laundry Machinery Co. (Mail: 229 Elmdorf Ave., Rochester, N.Y.)

C. B. Benedict, Benedict Pattern Works, (Mail: 373 St. Paul St., Rochester 5, N.Y.)

Donald H. Rishor, Cons., G. F. Pettinos, Inc. (Mail: 318 Selye Terrace, Rochester 13, N.Y.)

SAGINAW VALLEY CHAPTER

Chairman—L. L. Clark, Plant Met., Buick Motor Div., (Mail: 2638 Forest Hill Ave., Flint 4, Mich.)

Vice-Chairman—Howard H. Wilder, Chief Met., Eaton Mfg. Co., Fdry. Div. (Mail: P. O. Box 18, Vassar, Mich.)

Secretary-Treasurer—Raymond H. Klawuhn, Accountant, General Foundry & Mfg. Co., P. O. 119, Flint, Mich.

Directors—Terms Expire 1950

M. C. Godwin, Asst. Supt., Bostick Fdry. Co. (Mail: 421 Jefferson Ave., Lapeer, Mich.)

Carl A. Tobias, Chairman, Science Dept., General Motors Institute (Mail: 1518 W. Paterson, Flint 4, Mich.)

Mendel A. Fair, Pres. & Gen. Mgr., Valley Steel Castings Co., 11th St., Bay City, Mich.

Directors—Terms Expire 1951

Albert E. Edwards, Gen. Frmn., Chevrolet Grey Iron Fdry. (Mail: 1032 Reed St., Saginaw, Mich.)

Norman J. Henke, Proc. Supt., Saginaw Malleable Iron Plant (Mail: 407 N. Porter, Saginaw, Mich.)

Fredrick Kent, Gen. Frmn., Buick Motor Div. (Mail: 1402 Ballenger, Flint Mich.)

Directors—Terms Expire 1952

Frank A. Buike, Personnel Dir., The Almont Mfg. Co. (Mail: 540 N. Almont Ave., Imlay City, Mich.)

A. T. Peters, Research Met., Dow Chemical Co. (Mail: 326 Harrison St., Midland, Mich.)

Harvey S. Durham, Chief Insp., Chevrolet Grey Iron Fdry., Saginaw, Mich.

ST. LOUIS DISTRICT CHAPTER

Chairman—George N. Shepherd, Sterling Steel Casting Co., East St. Louis, Ill.

Vice-Chairman—John Williamson, Slsmn., M. A. Bell Co., 217 Lombard St., St. Louis.

Secretary—Paul Retzlaff, Fdry. Mgr., Busch-Sulzer Bros. Diesel Eng. Co., Div. of Norberg Mfg. Co., 3300 S. Second St., St. Louis 18.

Treasurer—Henry W. Meyer, Sand Research, General Steel Casting Corp. (Mail: 5323 Lindenwood, St. Louis 9.)

Directors—Terms Expire 1950

F. W. Burgdorfer, Pres., Missouri Pattern Works, 4143 Laclede Ave., St. Louis 8.

Gordon McMillin, Met., General Steel Castings Corp. Commonwealth Plant, Granite City, Ill.

Richard L. Jones, Asst. Wks. Mgr., American Steel Foundries (Mail: 12 Hilldale Heights, Belleville, Ill.)

Robert E. Woods, Exec., M. W. Warren Coke Co., 607 Laclede Gas Bldg., St. Louis 1.

Directors—Terms Expire 1951

James F. Gilbert, Pres., J. F. Gilbert Co., Inc., 6010 McPherson, St. Louis 21.

Norman L. Peukert, Supv. Cupola, Carondelet Fdry. Co., 2101 S. Kingshighway Blvd., St. Louis 10.

Carl A. Pfanstiel, Wks. Mgr., Fulton Iron Works Co., 1209 Delaware Ave., St. Louis.

Walter A. Zeis, Foundry Supply & Equip. (Mail: No. 2 Armin, Webster Groves, Mo.)

Directors—Terms Expire 1952

Albert L. Hunt, Plant Supt., American Brake Shoe Co., National Bearing Div., 4930 Manchester Ave., St. Louis 10.

Albert S. Hard, Mold Frmn., St. Louis Steel Cstg. Co. (Mail: 5321 Nottingham Ave., St. Louis 9.)

Lloyd C. Farquhar, V.P. East St. Louis Casting Co., East St. Louis, Ill.

Clee Shy, Fdry. Supt., Banner Iron Works (Mail: 7026 Garesche, Jennings 2, Mo.)

SOUTHERN CALIFORNIA CHAPTER

President—Earl D. Shomaker, Patt. Shop Frm. Kay-Brunner St. Prod. Co., Alhambra, Calif.

Vice-President—John E. Wilson, Met. Engr., Climax Molybdenum Co. of Mich. 650 S. Grand Ave., Los Angeles 14.

Secretary—H. G. Pagenkopp, Part. Angelus Pattern Works, Huntington Park, Calif.

Treasurer—Henry W. Howell, Pres., Howell Foundry Co., Inc. Los Nietos, Calif.

Directors—Terms Expire 1950

Donald A. Eggleston, Ace Fdry. Ltd. (Mail 6207 Prospect Ave., Bell, Calif.)

James H. DeWald, Partner, Bell Foundry (Mail: Box 424, South Gate, Calif.)

Robert C. Coulson, Fdy. Supt., Iron & Steel Div. Kaiser Co., Inc., Fontana, Calif.

John J. Derkin, Frm., Los Angeles Steel Casting Co., Vernon, Calif.

Directors—Terms Expire 1951

James Barr, Pres. & Gen. Mgr., Compton Foundry, Compton.

Jas. R. Cady, Asst. Prof. of Mech. Engr., University of Southern Calif., Los Angeles 7.

Arthur E. Falk, Partner, Centrifugal Casting Co. (Mail: 3245 Cherry Ave., Long Beach, Calif.)

Ray Silva, Foundry Supt., Fairbanks Morse & Co. (Mail: 281 E. Cucamonga, Pomona, Calif.)

TENNESSEE CHAPTER

Chairman—K. L. Landgrebe, Fdy. Supt., The Wheland Co., 2205 Ringgold Rd., Chattanooga.

Vice-Chairman—Paul Arnold, Res. Mgr., United States Pipe & Foundry Co., 27th & Chestnut Sts., Chattanooga.

Secy-Treas.—Herman Bohr, Jr., Partner, Robbins & Bohr, Chattanooga Bank, Chattanooga 2.

Directors—Terms Expire 1950

W. P. Delaney, Pres., Eureka Foundry Co., Grove St., Chattanooga.

Porter Warner, Jr., Treas., Porter Warner Ind., Inc. (Mail: Lookout Mountain, Tenn.)

Wm. P. Willson, V. P. Athens Plow Co., Athens, Tenn.

Leonard Raulston, U. S. Stove Corp., South Pittsburgh, Tenn.

Directors—Terms Expire 1951

Charles B. Saunders, Tenn. Product & Chem. Corp., American National Bank Bldg., Nashville 3.

D. B. Shannon, Gen. Mgr., Somerville Iron Works, P. O. Box 991, Chattanooga.

Directors—Terms Expire 1952

Sam C. Northington, Fdry. Supt., Combustion Engineering Co., Inc., 1032 W. Main St., Chattanooga.

D. H. L. Bealer, Supt., American Brake Shoe Co., 1814 Grove St., Chattanooga 2.

TEXAS CHAPTER

Chairman—Charles R. McGrail, Pres., Texaloy Foundry Co., 1407 Hoefgen Ave., San Antonio.

Vice-Chairman—W. H. Lyne, III, Res. Engr., Hughes Tool Co. (Mail: 5623 Lawson, Houston.)

Secretary—P.B. Croom, Owner, Houston Pattern Works, (Mail: 5210 Canal, Houston 11.

Treasurer—E. W. Wey, Asst. Mgr., Dee Brass Fdry., 2408 Everett St., Houston 9.

Directors—Terms Expire 1950

H. L. Roberts, Vice-Pres., Oil City Iron Wks., Corsicana.

Edwin P. Clarke, Dist. Rep. Amer. Wheelabrator & Equip. Co., (Mail: 870 W. 31st, Houston.)

Joseph A. Wolf, Wolf Pattern Works, P. O. Box 1919, Houston.

E. O. Naquin, Acting Supt., Oil City Brass Works, Beaumont.

Directors—Terms Expire 1951

F. G. Huber, Pres. & Gen. Mgr., Able Supply Co., Inc., 5220 Texas, P. O. Box 2310, Houston 1.

M. J. Henley, Met., Texas Foundries, Inc., Lufkin, Texas.

Thurman Killman, Gen. Supt., Texas Steel Co., Hewpill St., Ft. Worth.

Directors—Terms Expire 1952

C. Eugene Silver, Wks. Mgr., Texas Electric Steel Cstg. Co., (Mail: Box 1418, Houston.)

Chas. Sibbitt, Owner, Refinery Castings Co., P. O. Box 5085, Dallas 2.

Henry W. Creeger, Jr., Field Engr., Electro Refractories & Alloys Corp. (Mail: 3915 Mulberry St., Houston 6.)

Gerald E. Smith, Vice-Pres., East Texas Elec. Steel Co., Inc., Longview, Texas.

John M. Bird, Owner, American Brass Foundry, 2627 E. Lancaster, Fort Worth.

TIMBERLINE CHAPTER

Chairman—C. O. Penney, Met., C. S. Card Iron Works Co. (Mail: 950 Julian St., Denver 4.)

Vice-Chairman—John W. Horner, Jr., Vice-Pres., Slack-Horner Brass Mfg. Co. (Mail: 3201 W. 29th Ave., Denver 11.)

Secretary—James E. Schmuck, Met., Rotary Steel Casting Co., 1425 5th St., Denver 4.

Treasurer—Thomas W. Widener, Sls. Rep., Amer. Manganese Steel Div., Amer. Brake Shoe Co. (Mail: 1821 W. Chaffee Pl., Denver.)

Directors—Terms Expire 1950

E. Byron McPherson, Sr. Pres., McPherson Corp., 1361 S. Broadway, Denver 10.

Pearson M. Payne, Mgr., Rotary Steel Casting Co., 1425 5th St., Denver.

James L. Higson, Supt., Western Foundry (Mail: 350 Jersey St., Denver 7.)

Philip A. Grimard, Fdry. Supt., General Iron Works, Denver.

Jack N. Carter, Mgr., American Foundry & Machine Co., Salt Lake City, Utah.

R. A. Bolen, Pres., Bolen Machine Works, Grand Junction, Colo.

Directors—Terms Expire 1951

William E. Norris, Act. Wks. Mgr., Amer. Manganese Steel Div., 4th & Wazee Sts., Denver.

A. H. Patten, Patten Engineering Co., 1732 Blake, Denver 2.

Arthur L. Schneider, Owner, Western Bronze & Brass Fdry., 1322 Blake, Denver 4.

James W. Silver, Pres., Ogden Iron Works Co., 2257 Lincoln Ave., Box 147, Ogden, Utah.

Directors—Terms Expire 1952

Ralph B. Adkins, Gen. Mgr., Foundry Div., Electron Corp., Denver.

Darrel C. Durant, Asst. Supt., U. S. Foundries, Inc., 1145 Quivas St., Denver 1.

C. C. Drake, Plant Supt., Griffin Wheel Co. (Mail: 2061 S. Clarkson St., Denver.)

TOLEDO CHAPTER

Chairman—Harry C. Schwab, Chf. Met., Bunting Brass & Bronze, (Mail: 3547 Maplewav Dr., Toledo 9.)

Vice-Chairman—Frank W. Beierla, Pres., Clinton Pattern Works, (Mail: 1215 Marmion Ave., Toledo 7.)

Secretary-Treasurer—R. C. Van Hellen, Unitcast Corp., 1111 E. Broadway, Toledo.

Directors—Terms Expire 1950

Brock L. Pickett, Chf. Insp., Unitcast Corp. (Mail: 3143 Drummond Rd., Toledo 12.)

B. J. Beierla, Met., E. W. Bliss Co., Toledo Machine & Tool Co. Div., 1420 Hastings St., Toledo.

Sherrill Kasle, V. P., The Kasle Iron & Metal Co., 1103 LaGrange St., Toledo.

Directors—Terms Expire 1951

Gerald Rusk, Pres., Freeman Supply Co., 1152 E. Broadway, Toledo.

John G. Blake, Supt., Alloys Founders, Inc., 1102 Girard St., Toledo 5.

R. H. Zoller, Zoller Casting Co., Bettsville, Ohio.

Directors—Terms Expire 1952

Ralph W. White, Fdy. Supt., E. W. Bliss Co. (Mail: 2115 Maplewood, Toledo 6.)

John Caulfiel, Owner, St. Clair Bronze & Aluminum Co., 19 St. Clair St., Toledo 4.

Fred P. Murschel, Asst. to Pres., Farrell Cheek Steel Co. (Mail: 714 Polk St., Sandusky, Ohio.)

TRI-STATE CHAPTER

Chairman—C. A. McNamara, Jr., Secy-Treas., Big Four Foundry Co., Inc., 621 E. Cameron, Tulsa, Okla.

Vice-Chairman—F. E. Fogg, Sales Engr., Acme Foundry & Machine Co., Coffeyville, Kans.

Secretary—Dan A. Mitchell, Slsmn., Progressive Brass Mfg. Co., 1702 E. 6th, Tulsa 4, Okla.

Treasurer—R. H. Timberlake, Slsmn., Metal Gds. Corp. (Mail: 1635 N. Denver, Tulsa 6, Okla.)

Directors—Terms Expire 1950

Frank R. Westwood, Sr., Mgr., ⅞ Service Foundry, 330 N. Rock Island Wichita, Kan.

B. P. Glover, Slsmn., M. A. Bell Co. (Mail: 1617 E. 22nd Pl., Tulsa, Okla.)

Dale Hall, Met., Okla. Steel Castings Co., P. O. Box 2709, Tulsa, Okla.

Directors—Terms Expire 1951

C. C. Beagle, Fdry. Supt., The Webb Corp., Webb City, Mo.

J. E. Winger, Secy-Treas., Tulsa Iron Works Co., P. O. Box 1165, Tulsa, Okla.

Directors—Terms Expire 1952

E. L. Merritt, Owner, Enid Foundry & Machine Co., Enid, Okla.

Jack M. Foster, Slsmn., Leland Equipment Co., 408 N. Main St., P. O. 950, Tulsa, Okla.

TWIN CITY CHAPTER

Chairman—Franklin A. Austin V. P., Crown Iron Works Co. (Mail: 2824 Utica Ave., Minneapolis 16.)

Vice-Chairman—S. L. Cameron, Jr., V. P., Valley Iron Works, Inc. (Mail: Rt. 56 St. Paul 9.)

Secretary-Treasurer—Lillian K. Polzin, Dir. Mfgr. Sec., Minneapolis Chamber of Commerce, 1750 Hennepin Ave., Minneapolis 3.

Directors—Terms Expire 1950

Stanley J. Sitarz, Partner & Mgr., Prospect Fdry. Co., 1225 Winter St., N. E. Minneapolis 13.

Charles Kausel, Co-Partner, Kausel Foundry (Mail: 2555 Ulysses St., N. E., Minneapolis 13.)

Francis J. Marrin, Pres., Marrin Foundry Inc., 416 Lincoln St., N. E., Minneapolis.

Carleton C. Hitchcock, V. P., R. C. Hitchcock & Sons, 3023 Snelling Ave., Minneapolis 6.

Directors—Terms Expire 1951

Joseph W. Costello, Pattn. Shop Fmn., American Hoist & Derrick Co. (Mail: 1319 W. Idaho Ave., St. Paul 4.)

Carl W. Olson, Jr., Fdry. Mgr., C. W. Olson Manufacturing Co., 1300 Quincy St., N. E., Minneapolis.

C. Fred Quest, V. P., J. F. Quest Foundry Co., 900 So. 4th St., Minneapolis 15.

Directors—Terms Expire 1952

Herbert H. Blosjo, Met. Mpls. Elec. Steel Cstgs. Co. (Mail: 4100 Golden Valley Rd., Minneapolis 11.)

Harry Blumenthal, Dist. Repr., R. Lavin & Sons, Inc., 334 N. 1st St., Minneapolis 1.

John Roth Supt., Progress Patt. & Fdry. Co. (Mail: 5115 Woodlawn Blvd., Minneapolis 6, Minn.)

WASHINGTON CHAPTER

Chairman—Edward D. Boyle, Master Molder, Puget Sound Naval Shipyard, x81 Foundry, Bremerton, Wash.

Vice-Chairman—J. F. Dolansky, Supt., Griffin Wheel Co., South Tacoma.

Secretary—Fred R. Young, Sales Engr., E. A. Wilcox Co. (Mail: 13631 1st, S. W., Seattle 66.)

Treasurer—W. R. Tompkins, Mgr., Western Foundry Sand Co., 1039 Elliott Ave., W., Seattle.

Directors—Terms Expire 1950

Frank H. Jefferson, Slsmn., Carl F. Miller Co. (Mail: 6840 48th N. E., Seattle 5.)

James D. Tracy, 6023 Sycamore St., Seattle 7.

George E. Rauen, Olympic Steel Casting Co., 151 Horton St., Seattle 4.

Directors—Terms Expire 1951

Samuel Fick, Supt., Fick Foundry, 1005 East D St., Tacoma.

Edward J. McAfee, Master Molder, Puget Sound Naval Shipyard (Mail: Rt. 2, Box 696, Bremerton, Wash.)

Barton N. Sather, Owner, Sather Foundry Co., 3330 McDougall Ave., Everett, Wash.

WESTERN MICHIGAN CHAPTER

Chairman—C. N. Jacobson, Prod. Mgr., Dake Engine Co., Grand Haven, Mich.

Vice-Chairman—Stanley H. Davis, Sand Res. & X-Ray, Campbell, Wyant & Cannon Fdry. Co. (Mail: 1060 Ada Ave., Muskegon, Mich.)

Secretary—Ross P. Shaffer, Metallographer, Lakey Foundry & Machine Co., 1st & Water Sts., Muskegon, Mich.

Treasurer—Lauren Ramsey, Paul M. Wiener Foundry Co., Muskegon, Mich.

Directors—Terms Expire 1950

Harold C. BeMent, Chf. Met., Campbell, Wyant & Cannon Fdry Co. (Mail: 1195 Pine St., Muskegon, Mich.)

Robert DeVore, Supv. Mltg., Lakey Fdry. & Mach. Co. (Mail: 1768 S. Wolf Rd. R. 26, Muskegon, Mich.)

Victor A. Pyle, Asst. Secy. Pyle Pattern & Mfg. Co., Muskegon Heights, Mich.

W. A. Hallberg, Fdry. Engr., Lakey Foundry & Machine Co., Muskegon, Mich.

Directors—Terms Expire 1951

Roy H. Herbst, Supt., W. Michigan Steel Fdry. (Mail: 1420 Clinton St., Muskegon 22, Mich.)

Wm. R. Tuthill, Supt. Iron Div. American Seating Co., 901 Broadway Ave., N. W., Grand Rapids.

C. H. Lloyd, Engr., E. F. Houghton & Co. (Mail: 905 Chippewa Drive, Grand Rapids.

Directors—Terms Expire 1952

Earl Paul Babcock, Purch. Agt., The Challenge Machinery Co., Grand Haven, Mich.

Kenneth C. McGready, Met., Muskegon Piston Ring Co., Sparta, Mich.

Wm. T. Holt, Pres., Enterprise Brass Works, McCracken Ave., Muskegon, Mich.

WESTERN NEW YORK CHAPTER

Chairman—John R. Wark, Sales Dept., Queen City Sand & Supply Co., 1807 Elmwood Ave., Buffalo 7.

Vice-Chairman—Alfred A. Diebold, Wks. Mgr., Atlas Steel Casting Co., 1963 Elmwood Ave., Buffalo.

Secretary—Roger E. Walsh, Sls. Repr., Hickman Williams & Co. (Mail: 32 Eastwood Place, Buffalo 8.)

Treasurer—M. W. Pohlman, Vice Pres., Pohlman Foundry Co., Inc., 205 Baitz Ave., Buffalo.

Directors—Terms Expire 1950

Leonard Greenfield, Plt. Mgr., Samuel Greenfield Co., 31 Stone St., Buffalo.

Carl A. Harmon, Chief Met., Hanna Furnace Corp., 1000 Walbridge Bldg., Buffalo.

Edw. J. Roesch, Supt., American Brake Shoe Co., 1673 Bailey Ave., Buffalo 12.

Martin J. O'Brien, Jr., Asst. Works Mgr., Symington-Gould Corp. (Mail: 180 Lake Ave., Lancaster, N. Y.)

Directors—Terms Expire 1951

Walter D. Hunsicker, Fdry. Supt., Worthington Pump & Mach. Co. (Mail: 165 Highland, Williamsville 21, N. Y.)

George A. Knowles, Owner, George A. Knowles Foundry Inc., Niagara Falls.

Henry F. Sproull, Dist. Rep., A. P. Green Fire Brick Co., Crosby Bldg., 170 Franklin St., Buffalo.

Directors—Terms Expire 1952

A. J. Heysel, Branch Mgr., E. J. Woodison Co., 146 Chandler St., Buffalo 7.

Robert Bruce, Asst. Fdry. Supt., Blaw-Knox Co. (Mail: 80 Allandale Rd., Buffalo 21.)

Robert D. Young, Purch. Agt., Lumen Bearing Co., 197 Lathrop St., Buffalo 12.

WISCONSIN CHAPTER

President—R. C. Woodward, Chief Met., Bucyrus-Erie Co., South Milwaukee, Wis.

Vice-President—Walter W. Edens, Tech. Dir., Badger Brass & Alum. Fdry. Co., 5120 W. State St., Milwaukee 8.

Secretary—George E. Tisdale, Secy.-Treas., Zenith Foundry Co., 1501 S. 83rd St., Milwaukee 14.

(Continued on following page)

WISCONSIN CHAPTER (continued)

Treasurer—Leon H. Decker, Supt. Planning & Time Study, Allis-Chalmers Mfg. Co. (Mail: 1564 S. 82nd St., West Allis, Wis.)

Directors—Terms Expire 1950

R. J. Anderson, Wks. Mgr., Belle City Malleable Iron Co., 1442 Forest St., Racine.

Albert F. Pfeiffer, Allis-Chalmers Mfg. Co. (Mail: 1610 S. 78th St., West Allis 14, Wis.)

J. G. Risney, Owner, Risney Foundry Equipment Co., 1307 N. 63rd St., Milwaukee 13.

Directors—Terms Expire 1951

Charles Fuerst, Asst. to Supt., Falk Corp., Milwaukee.

J. Vincent Olle, Met., Motor Castings Co., 1323 S. 65th St., West Allis, Wis.

Directors—Terms Expire 1952

Kenneth Geist, Tech. Eng.-in-Chge. Precision Cstg. Sec., Allis-Chalmers (Mail: Box 87D, R.R. #1, Hales Corners, Wis.)

J. B. Gutenkunst, Secy.-Treas., Milwaukee Mall. & Grey Iron Wks., 2773 S. 29th St., Milwaukee 8.

Frank McLean Jacobs, Sls. Mgr. & Asst. to Pres., Standard Brass Works (Mail: 1704 N. 71st St., Wauwatosa 13, Wis.)

SEPTEMBER 16

TEXAS

Plaza Hotel, San Antonio

Films: *"Gating Systems for Metal Castings"; "Finger Gating and Step Gating"*

SEPTEMBER 17

NORTHWESTERN PENNSYLVANIA

Tiemann's Grove and Lake Shore Golf Club, Erie

ANNUAL PICNIC

SEPTEMBER 19

QUAD CITY

Ft. Armstrong Hotel, Rock Island

NELSON S. MOSHER

Alloy Metal Abrasive Co.

"History & Development of Steel Shot for Cleaning"

SEPTEMBER 20

EASTERN NEW YORK

Circle Inn, Lathams

NORMAN J. HENKE and WILLIAM MCCARTHY

Central Foundry Division, GMC

Film: *"Better Methods Applied to Foundry Operation"*

SEPTEMBER 21

SOUTHERN CALIFORNIA

Rodger Young Auditorium, Los Angeles

FREDERICK G. SEFING

International Nickel Co.

"Selling the Advantages of Castings to Engineers"

SEPTEMBER 23

CHESAPEAKE

Country Club, Hagerstown, Md.

PLANT VISITATIONS TO PANGBORN CORP. AND FAIRCHILD AIRCRAFT CORP. DURING DAY.

Evening speaker: FRANK BREWSTER

Harry W. Dietert Co.

"Foundry Technique of Sand Testing"

SEPTEMBER 26

NORTHWESTERN PENNSYLVANIA

WILLIAM BALL, JR.

R. Lavin & Sons, Inc.

"Essentials of Producing Required Results in the Foundry"

TIMBERLINE

Silver Wing Cafe, Denver

FRANK G. STEINBACH

Penton Publishing Co.

Subject to be announced.

SEPTEMBER 30

ONTARIO

Royal Connaught Hotel, Hamilton

GROUP MEETINGS

OCTOBER 1

MICHIANA

Tabor Farm, Sodus, Mich.

ANNUAL STAG OUTING

OCTOBER 3

MICHIANA

Whitcomb Hotel, St. Joseph, Mich.

JOHN SOET

Michigan Department of Health

Subject to be announced.

CENTRAL INDIANA

Athenaeum, Indianapolis

R. G. MCELWEE

Vanadium Corp. of America

"Nodular Cast Irons"

WESTERN MICHIGAN

Cottage Inn, Muskegon

C. J. FREUND

University of Detroit

"Youth Encouragement"

METROPOLITAN

Essex House, Newark, N. J.

CLYDE A. SANDERS

American Colloid Co.

"Care and Handling of Sand"

OCTOBER 5

TOLEDO

Toledo Yacht Club

"Let's Pretend"

OCTOBER 7

WESTERN NEW YORK

Hotel Sheraton, Buffalo

PETER F. ROSSMAN

Symington-Gould Corp.

Subject to be announced.

OCTOBER 10

CENTRAL OHIO

Chittenden Hotel, Columbus

Discussion: *"Nodular Iron"*

OCTOBER 13

DETROIT

Engineering Society of Detroit

Film: *"Fluid Flow"*

ST. LOUIS DISTRICT

ZIGMUND MADACEY

Caterpillar Tractor Co.

"Coremaking and Coreblowing"

OCTOBER 14

PHILADELPHIA

Engineers' Club, Philadelphia

W. H. JOHNSON

Naval Research Laboratory

"Gating Systems"

OCTOBER 14

CENTRAL NEW YORK

Mark Twain Hotel, Elmira

Speaker to be announced.

Questions and Answers — THE ROUND TABLE

City Water Corrodes High Zinc Bronze

We are engaged in the manufacture of various sizes of water works valves and for a number of years have used standard bronzes for the various working parts of the valves, including the discs or wedges, seat rings, threaded stems, stem nuts, glands, etc. The valve stems are running in a 70 to 80,000 psi tensile manganese bronze, and the other parts are in some of the normal red brasses or bronzes such as 85-5-5-5.

We are anxious to find a substitute for the manganese and relatively high zinc bronzes because of the electrolytic action of our city water on these materials. In every respect, the substitute material must be the equivalent in corrosion resistance, strength, and general physical properties.

Chemical analysis of our city water (average for the fiscal year 1946-47) follows:

	Aqueduct Sources	*River Sources*	*Water District (As delivered)*
	All chemical results in parts per million		
Specific Electrical conductance (Kx10⁶)	44.2	78.1	116.0
pH	8.39	7.68	8.93
*Temperature (degrees Fahrenheit)	62°	66°	66°
Total Dissolved Solids	287	507	754
Total Hardness ($CaCO_3$)	120	298	132
Alkalinity ($CaCO_3$)	154	200	80
Sulfates (SO_4)	47	156	334
Chlorides (Cl)	23	35	97
Nitrates (NO_3)	0.29	11.52	0.00
Phosphates (PO_4)	0.35	0.28	0.26
Calcium (Ca)	33	81	30
Magnesium (Mg)	9	23	14
Sodium (Na)	47	55	194
Potassium (K)	5	3	3
Silica (SiO_2)	12	18	10
Iron (Fe)	0.04	0.004	0.01
Aluminum (Al)	0.05	0.01	0.02
Manganese (Mn)	0.025	0.001	0.001
Boron (B)	0.55	0.21	0.15
Fluoride (F)	0.71	0.37	0.42

To obtain results in grains per gallon, divide parts per million by 17.1. A maximum deviation of 25 per cent from the average may be expected during the year.

***As water enters distribution system, distribution temperatures vary from 45°—85°F, depending on time of year, size of mains, depth of mains, rate of flow, distance from reservoir, etc.**

It is not surprising that manganese bronze has not proved satisfactory as a valve stem material under the particular conditions of operation in the water of the analysis given above. Monel metal given in Navy specification 46M1f (Ni, 60 per cent min.; Cu, 23 min.; Fe, 3.5 max.; Al 0.5 max.; Mn, 3.5 max.; Si, 2.0 max.) or aluminum bronze, Navy specification 46B18C (Cu, 85.0-89.0 per cent; Fe, 2.5-4.0; Al, 7.0-9.0; other elements, 1.0 max.), would be likely replacements.

The strength of both of these alloys as cast will be of the same order as that of manganese bronze, and there can be no dezincification. To obtain additional strength above that of manganese bronze, the possibility of heat treatment should be explored. The use of wrought material for valve stems might also be profitable. Wrought monel metal for valve stems for operation with sea water is common practice.

Combination Of Factors Causes Beads

What is the mechanism by which shot or beads of metal are forced out of castings during solidification? We occasionally find these little balls of metal in cavities in defective castings and on top of risers. We think they may be the same defect as is illustrated in the A.F.S. publication *Analysis of Casting Defects*, Fig. 1, page 4, and Fig. 16, page 14.

This type of defect is reported in the literature as occurring, in some instances, at the bottom of a bright-surfaced blow hole in gray iron. The explanation is that the metal surface at the bottom of the blow hole was effectively insulated from cooling by the mold wall and was still spongy at the time graphite was formed in the liquid interior of the casting. Since graphite formation is accompanied by a volume increase, some of the remaining liquid was forced through the spongy area and oozed into the cavity as a small bead.

This occurrence is fundamentally the same mechanism which has given rise to the term "negative shrink" in some permanent mold shops. It is reportedly not uncommon when pouring a high-carbon, high-silicon iron into permanent molds to have the downsprue or riser bleed metal at the top shortly after the mold has been poured, and the explanation is identical. The volume increase occurring with graphite formation forces liquid metal through a hot spot or a break in the skin of the casting. The condition is most likely to occur with high phosphorus irons since phosphorus promotes a long freezing range.

Another example of the same phenomenon is the

occasional sweating of chilled tread car wheels in which small beads of metal appear on the chilled surface. Similar defects are seen in leaded bronze castings where lead beads are found in surface blows. Here the evidence is quite conclusive that the bead is formed last, since lead definitely is the last liquid portion of the casting and it, not some other constituent is found in the bead. The internal pressure acting in this instance is probably gas pressure.

We are not familiar with beads of this nature ever being found in steel castings. Probably the quicker and more solid skin formation associated with steel prevents bleeding.

Norman A. Birch, *Process Met.*
American Brake Shoe Co.
Mahwah, N. J.

The mechanism of short formation in gray iron is predicated on two basic conditions: (1) The presence of phosphorus in the base iron, and (2) an area on the casting surface cooling with sufficient slowness to permit the passage of shot from the interior outward.

As gray iron cools and solidifies phosphorus segregates toward the region last to solidify. The increased phosphorus concentration forms phosphide eutectic which prolongs final solidification by virtue of its lower freezing temperature. Eventually, as the surrounding metal solidifies, sufficient pressure is exerted on the still molten, high phosphorus material, to force it to the surface.

The surface, however, must have cooled slowly to be soft enough to permit penetration by the shot. A mold open to the atmosphere on one surface, for example, would meet the requirement. Another circumstance would be when a casting forms a shrinkage cavity in which the original metal surface is drawn down within the casting proper, leaving a pocket of hot, insulating mold gases.

The illustrations show the cross section of a bead (X30, nital etch) and the high proportion of phosphide eutectic (light, mottled areas) at a magnification of X500.

Lyle L. Clark, *Asst. Fdry. Met.*
Buick Motor Division, GMC
Flint, Mich.

Foremen's Club Needs Films

We are running out of films for showing at our monthly Foremen's Club meetings and thought you might have some films on foundry work or related subjects we could rent.

A copy of the A.F.S. FILM DIRECTORY is in the mail to you. Indicated in the DIRECTORY is the source of each film, running time, size and other characteristics as well as any costs involved. The films are not available through A.F.S. Headquarters; please contact the owner or producer of the film directly.

Only film obtainable through Headquarters is the recently released film on the flow of metal into a mold. Outgrowth of the A.F.S. Aluminum and Magnesium Research Project, the film has been acclaimed by all who have viewed it. Arrangements for showing can be made by writing to the Technical Director, American Foundrymen's Society, 222 West Adams St., Chicago 6, Ill. Rental is $10.00.

Magnesium Alloy Molding And Melting

Can you furnish complete information on the preparation of sand for the molding of magnesium alloy castings? If you can furnish melting instructions please include these as well.

The special techniques of sand mixing and melting for magnesium alloys do not lend themselves to brief discussion. We refer you to the recently published A.F.S. booklet RECOMMENDED PRACTICES FOR SAND CASTING ALUMINUM AND MAGNESIUM ALLOYS.

Letters to the Editor

Italian Foundrymen Like Us

I should like to express to you all my appreciation and that of my Italian colleagues for the way in which AMERICAN FOUNDRYMAN is presented. It will serve as an example for the magazine Italian foundry technicians have in mind to publish in the near future.

MARIO OLIVO, *Owner*
Impiante Fonderie Olivo
Milan, Italy

M. Olivo is author of "*Biringuccio —foundryman of 1500*" which appeared in the July, 1949, issue of *American Foundryman*, page 28. Possessor of a rare and detailed documentation of the foundry techniques of the time of Agricola, Biringuccio, and Da Vinci, he keeps up to date with modern foundry practices by serving as president of the Italian Foundrymen's Society and of the Foundry Equipment Manufacturers of Italy, and as a director of the Italian Metallurgical Association.

Irish Ironfounders' Association Is New Name Of Organization

At a general meeting of the Ironfounders' Association of Eire, held July 28, it was unanimously agreed to change the name of the organization to Irish Ironfounders' Association. This will be the name of our association from now on which, as before, will look after the interests of the iron founders in this country.

For the first time in many years British foundry coke is available to the foundries in Ireland, the price being $32 per ton delivered in Dublin. Pig iron has not yet become available from the pre-war suppliers in Britain, but plentiful supplies are available from Belgium at a price of $68.72 per ton which is about $20 lower than the price six months ago. Supplies of scrap iron available in the country show signs of falling off, although offers of supplies from European countries are being made.

S. W. AITKEN, *Director*
Hammond Lane Ironfounders Ltd.
Dublin, Eire

Mr. Aitken, chairman of the Irish Iron-founders' Association, is an *American Foundryman* correspondent and contributor ("Irish Foundry Modernizes," April, 1949, page 98).

Clarifies Our Version Of French Story

We read your interesting article on the Foundry Technical Center of France in the May, 1949, issue of AMERICAN FOUNDRYMAN, page 77. Will you allow us to make some points clearer? Otherwise there would perhaps remain doubt in your readers' minds about the Technical Center.

The number of readers which AMERICAN FOUNDRYMAN enjoys makes it important to have accurate information published on our Center.

The purposes of the Centre Technique des Industries de la Fonderie are—according to the Act of July 22, 1948—to promote technical progress, to help obtain a better production, and to guarantee a high standard of quality in industry. It leads researchers for the benefit of the whole profession. Its engineers act as consulting engineers to foundrymen, either by letters or calls.

But the Center has no commercial activity whatever. It makes no trade agreements, does not mediate between bargaining groups, nor does it establish sales practices. It is no way a clearing house for technical information or personnel.

As for its resources, it is true that they are obtained from a compulsory tax, only that the tax is levied on the turnover of the French foundries, not on their capital.

It has recently been decided that regional laboratories will be financially supported from now and in the future by the Center.

The Technical Foundry Association differs from the Center in that its members are individuals, not firms, who join voluntarily and not in order to comply with the Law. The Association is supported by their fees.

We would add a word about the National Foundry School (Ecole supérieure de Fonderie). Its pupils are admitted on competition unless they come from certain colleges for engineers in which case they are admitted without examination. They are about 22 or 23 years old, therefore the Foundry School is in fact a specialized college for students who, before entering it, have followed general studies at a high theoretical level.

A. LE THOMAS, *Director General*
Centre Technique des Industries
de la Fonderie
Paris, France

How Do You Handle Coke?

For many years we have unloaded coke by grab bucket into charging bins or to storage on the ground. We experienced no great difficulty with this method until the past few years when we have encountered unusual breakage. This causes considerable loss in fines and serious trouble in cupola operation due to high pressures.

We have three widely separated melting units precluding the possibility of an adequate conveyor system except at great expense. We have examined the possibility of using container cars but find the supply is inadequate with no prospect for improvement.

One foundry we visited is meeting the situation by ordering coke in hopper gondolas. Coke is unloaded on a portable conveyor into drop-bottom containers. These are picked up and the coke is dropped into charging bins. Storage coke is unloaded similarly except that a second conveyor deposits coke on the pile. Coke from storage is loaded into containers by portable conveyor and from there into bins as needed.

This method seems to be the most practical we have studied to date and it is likely that we shall proceed along this line. Breakage is low and cost of installation and operation is reasonable. We anticipate that one man can pretty well take care of the unloading. We propose to have a number of containers placed on portable rolls. As one container is filled we can push it out of the way and go on to the next until we have loaded enough to place on a railroad flat car. This will be moved to the melting operation for unloading by hoist into bins.

Someone may have developed a better solution to a similar problem during the past few years. If so, we should like to learn about it.

N. HAROLD BOARDMAN, *Asst. Mgr.*
General Electric Co.
Elmira, N. Y.

We are trying to solve an especially knotty problem in handling coke by mechanical methods in a highly restricted unloading space. If we could employ a bucket elevator we believe we could overcome our handicaps.

We have asked a number of people if they knew of anyone handling foundry coke by bucket elevator. The answer has always been that they know of no one who handles coke this way nor do they know of any reason why coke is not handled in this manner.

Can you put me in touch with someone handling coke by bucket elevator?

W. E. ILLIG, *Vice-President*
Banner Iron Works
St. Louis

Coke handling installations seem to be rather standardized although there are rumors of unusual conveyor belt installations which have been constructed for special purposes. *American Foundryman* readers are invited to send descriptions of out-of-the-ordinary coke handling installations for transmittal to Mr. Boardman and Mr. Illig. Most unusual installations described and illustrated will be published in "The Foundrymen's *Own* Magazine." —*Editor*

Beats Operating Difficulties, Makes Cast Iron Lathe Tool

We are in debt to AMERICAN FOUNDRYMAN for the interesting and useful articles on nodular graphite cast iron. We have carried out many tests since early 1948 with magnesium as the chief inoculant in cupola melted irons.

We have a small workshop with a cupola and a crucible pit furnace. Last year I went to England to acquire first-hand knowledge of melting alloy cast

(Continued on Page 87)

Wm McFatridge

FOUNDRYMAN—ARTIST

THIS MONTH'S COVER is the work of William O. McFatridge, assistant superintendent of foundry at International Harvester Co.'s Farmall Works, Moline Ill. Equally at home in an artist's studio or a foundry, Bill McFatridge has combined industrial know-how and a talent for drawing since college days.

It was while at the University of Michigan that Bill's aptitude for design attracted the attention of his mechanical engineering instructor, who persuaded him to attend Chicago's Art Institute. After completing a three-year course there, Bill joined a Chicago engraving house, where he became acquainted with the reproduction of artwork for publications.

Following a brief period as an artist-draftsman with the Western Electric Co., he became an engineer in the Stoker Sales department of the Link Belt Co., Chicago. Since Bill's job entailed not only selling but designing of stokers, he found himself more and more frequently in the company's foundry, observing the casting of stoker parts. The colorful casting process proved fascinating to the young engineer-artist, and he began to ask engineer friends questions about the foundry industry.

One in particular, a member of the staff of the International Harvester Co., was impressed by Bill's unusual combination of talents and enrolled him in International Harvester's Foundry Student Course.

During the course, Bill was moved from foundry to foundry, learning various casting operations, and upon its completion was made a foreman and sent to Harvester's Indianapolis foundry, then being built.

It was during the construction of the Indianapolis foundry that Bill's hobby of sketching came into use by the company. He was asked if he could make a large drawing of the completed foundry, showing its various units in operation. When completed, the drawing was shown to International Harvester's top management to help it visualize the foundry in operation.

During the war, International Harvester sent Bill from one to the other of its plants as a war materials expediter. In going from foundry to foundry, he observed and sketched different riggings and operations that might assist other foundries in speeding up production of similar castings. These sketches proved the old adage, "One picture is worth a thousand words," in putting across complex ideas to groups of foundrymen, each of whom was likely to form a different concept of the same verbal description of a foundry process.

Bill McFatridge, artist and foundryman, is by no means unique in the history of the industry—some of the world's greatest works of art have been conceived by men who have combined creative genius in the fine arts with craftsmanship in the casting of metals. In Bill's own words, "All in all, I find it not too strange for a foundryman to be able to create in some field of art—after all, the foundry industry creates many of the needs and pleasures of today."

Bill McFatridge is one of a number of foundrymen who have unusual hobbies and abilities. Others include the foundryman who is an accomplished organist, another who directs his city's philharmonic orchestra, and a third who is an able bandmaster and judge of music contests in Canada and the United States. One foundryman became interested in the industry because he operates his own backyard foundry purely as a hobby! Several have authored non-technical books.

Foundrymen are urged to write to AMERICAN FOUNDRYMAN telling of their unusual hobbies, skills, or abilities, or those of fellow foundrymen so that their stories can be told to the world-wide readership of "The Foundrymen's *Own* Magazine."

J. J. Silk

James J. Silk, author of *"Molding Sand Standardized,"* Page 51, is sand technician for Taylor & Co., Inc., New York... He attended, successively, the New York Business School, Brooklyn Technical Institute, Pratt Institute, and is a graduate of the I.C.S. Foundrymen's Course and the Naval Engineering School, Great Lakes, Ill. . . . He began his foundry career as a patternmaker with Brown & Co., New York, and was with Taylor & Co. from 1937 to 1943, when he joined the Navy . . . He returned to Taylor & Co. following the war, and is now sand technician with that company.

J. S. Gupta

J. S. Gupta, author of *"Pouring Brake Shoes in India,"* Page 38, is foundry and pattern shop foreman for India's B.B.C.I. Railway . . . Born in Ajmer, India, he attended high school and college there, and graduated from Allahabad University in 1922 . . . The following year, Mr. Gupta joined the B.B.C.I.'s Locomotive Workshops as an apprentice in the Wheel, Axle Tire Fitting, Tool, Machine and Millwright's Shops, successively . . . Following this, Mr. Gupta was appointed an inspector in the railroad's production and planning department, and, after 10 years, was made chief planner . . . Since 1946, Mr. Gupta has been foundry and pattern-shop foreman.

R. E. Morey

Robert E. Morey, whose article, *"Standard Test Sand Selected,"* Page 32, deals with grading of molding sands, is chairman of the A.F.S. Sand Division's Grading and Fineness Committee . . . A graduate of Rensselaer Polytechnic Institute (1932), Mr. Morey joined the Washington Naval Gun Factory, Washington, D. C., as a melter in 1934 . . . In 1937, he was appointed contract technician for the Naval Research Laboratory, Washington, D. C., and to his present position as metallurgist there in 1942 . . . A prolific writer, his papers on molding sands have appeared in A.F.S. TRANSACTIONS and in AMERICAN FOUNDRYMAN, and he has spoken on the subject before last year's Wisconsin Regional Foundry Conference, and the 1947 meeting of the National Industrial Sand Association. . . He is a member of the A.F.S. Green Sand Properties and Revision of Sand Test Handbook Committees.

Wm. Romanoff

William Romanoff, author of *"Quality Control Review—Tests for Brass, Bronze and Nickel Alloy Castings,"* Page 40, is a past chairman of the A.F.S. Brass & Bronze Division, and has for many years been prominent in A.F.S. technical committee work . . . A graduate of the University of Michigan in 1920 with a B.S. in Chemical Engineering, Mr. Romanoff was first employed as metallurgist with the Ohio Brass Co., Mansfield, Ohio . . . In 1925, he joined H. Kramer & Co., Chicago, where he is today vice-president and technical superintendent . . . He has been a frequent speaker at Chapter, Regional and National meetings of the Society, and is active in committee work for ASTM, AIME, ASM, AIMME and the British Institute of Metals.

J. E. Rehder

J. E. Rehder, author of *"Magnesium Additions and Desulphurization of Cast Irons,"* Page 33, is foundry engineer for the Canadian Bureau of Mines, Ottawa, Ont. . . . Canadian born, Mr. Rehder graduated from McGill University in 1940 with a bachelor's degree in Metallurgical Engineering . . . His senior thesis won him a Dawson Memorial Fellowship that same year, but his work on the Fellowship was interrupted by the war . . . From 1941 to 1943, Mr. Rehder served as chief metallurgist for Walker Metal Products, Ltd., Windsor, Ont. . . . He was appointed assistant manager of Bowmanville Foundry Co., Ltd., Bowmanville, Ont., in 1943 and held that position until the following year, when he was made chief metallurgist for the Gunnell Co. of Canada, Ltd., Toronto . . . He has been with the Canadian Bureau of Mines since 1947 . . . Mr. Rehder has done extensive research into the properties of malleable irons and has presented many papers on the subject before meetings of the American Foundrymen's Society and other technical groups . . . He is a member of the A.F.S. Cupola Research, Controlled Annealing Atmosphere, and College Research Projects Committees.

Cast Aluminum Wrench

AN ALUMINUM PIPE WRENCH, so light in weight that a girl can easily lift the large four-foot size, is now being cast of 40-E Aluminum Alloy by the Frontier Bronze Co., Niagara Falls, N.Y.

The aluminum wrench has an extra strength quality that enables it to meet all standard specifications for steel pipe wrenches, but with less than half the weight of steel.

Tests have shown that the cast aluminum pipe wrench will withstand pressures of 13,500 psi—the standard Government specification for pipe wrenches. This is the equivalent of 900 lb pressure applied 15 in. from the wrench jaws. The wrench is manufactured in 14, 18, 24, 36 and 48 in. sizes.

New AFS MEMBERS

NEW COMPANY MEMBERS

Martin Machine & Foundry Co., Centerville, Iowa—George G. Groves (Quad City Chapter).

American Brake Shoe, National Bearing Div., Meadville, Pa.—C. S. Ban (Northwestern Pennsylvania Chapter) Conversion from Personal.

BIRMINGHAM CHAPTER

R. W. Sandelin, Chief Met., Stockham Valves & Fittings, Birmingham.

CHESAPEAKE CHAPTER

Herbert M. Frazier, Met. Engr., Navy Dept., Bureau of Ordnance, Washington, D. C.

Kenneth B. Frazier, Appr. Molder, U. S. Naval Gun Factory, Washington, D. C.

CHICAGO CHAPTER

Bruce C. Augustin, Prog. Fdy. Student, International Harvester Co., Tractor Works, Chicago.

William D. Chapman, Sls. Repr., Baker Perkins Inc., Chicago.

Stephen Emery, Fdy. Fmn., Love Brothers, Inc., Aurora, Illinois.

H. A. Fabert, American Brake Shoe Co., American Manganese Steel Div., Chicago Hts.

Robert F. Grover, Vice Pres., & Sales Manager, Love Brothers, Inc., Aurora, Illinois.

Robert Hendry, Fdy. Supt., Love Brothers, Inc., Aurora, Illinois.

L. S. Teets, American Brake Shoe Co., American Manganese Steel Div., Chicago Hts.

B. S. Weselis, American Brake Shoe Co., American Manganese Steel Div., Chicago Hts.

CINCINNATI CHAPTER

H. Lambert, Supt., U. S. Pipe & Foundry Co., Addyston, Ohio.

Wm. E. Schmidt, Jr., Res. Mgr., U. S. Pipe & Foundry Co., Addyston, Ohio.

DETROIT CHAPTER

John Charles Hamaker, Jr., Student, University of Michigan, Ann Arbor, Mich.

Caroline W. Lutz, Lib., General Motors Corp., Res. Lab. Div., Detroit.

EASTERN CANADA CHAPTER

Donald F. Berry, Chemist, Crane Ltd., Montreal, Que., Canada.

Edward Albert Jude, Asst. Dir. of Res., Canadian Car & Fdy. Co. Ltd., Montreal, Que., Canada.

Richard C. Tracy, Appr., Dominion Engrg. Wks., Ltd., Lachine, Que., Canada.

EASTERN NEW YORK

Robert A. Rege, Student, Rensselear Polytechnic Institute, Troy, New York.

Lyman C. Thunfors, Vice Pres., & Gen. Mgr., Rensselear Valve Co., Troy, N. Y.

MICHIANA CHAPTER

H. Oliver Pels, Fdy. Supt., Grey Iron Div., Benton Harbor Mall. Indus. Inc., Benton Harbor, Mich.

NORTHEASTERN OHIO CHAPTER

Louis Champa, Fdy. Fmn., National Mall. & Steel Cast. Co., Cleveland.

J. Tjemmes, Asst. Supt., American Brake Shoe Co., Electro-Alloys Div., Elyria, Ohio.

Robert W. Vanek, Patternmaker, Elyria Fdy. Div., Industrial Brown-Hoist Corp., Elyria, Ohio.

Earl Youmell, Fdy. Fmn., National Mall. & Steel Cast. Co., Cleveland.

NORTHWESTERN PENNSYLVANIA CHAPTER

A. S. Haines, American Brake Shoe Co., National Bearing Div., Meadville, Pa.

Erich C. Pletsch, Plt. Supt., Exomet, Inc., Conneaut, Ohio.

OREGON CHAPTER

Clarence A. Anderson, Melt. Fmn., Electric Steel Fdy., Portland.

PHILADELPHIA CHAPTER

Irvin L. Bossler, Fdy. Supt., Reading Steel Cast. Div., American Chain & Cable Co., Inc., Reading, Pa.

Maurice C. Johnson, Prod. Engr., Janney Cylinder Co., Philadelphia.

QUAD CITY

Martin Machine & Foundry Co., Centerville, Iowa—George G. Groves.

Mervin H. Horton, Fdy. Met., Deere & Co., Moline, Ill.

Wendell K. Hunt, Plt. Met., John Deere Harvester Wks., E. Moline, Ill.

SAGINAW VALLEY CHAPTER

Arthur D. Barrett, Chevrolet Grey Iron Foundry, General Motors Corp., Saginaw, Mich.

TEXAS CHAPTER

James W. Byrnes, Sls. Engr., E. F. Houghton & Co., Houston.

James R. Hewitt, Mfgrs. Repr., James R. Hewitt, Houston, Texas.

TRI-STATE CHAPTER

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Ralph J. Vanden Heuvel, Milwaukee Chaplet & Mfg. Co., Milwaukee.

George R. Little, Milwaukee Chaplet & Mfg. Co., Milwaukee.

William A. Thompson, Milwaukee Chaplet & Mfg. Co., Milwaukee.

Howard L. Zettler, Vice Pres., Milwaukee Chaplet & Mfg. Co., Milwaukee.

ENGLAND

John George Bailes, Fdy. Mgr., Wm. Jessop & Sons Ltd., Sheffield.

Ronald Edward Boone, Wks. Mgr., British Beth Co. Ltd., Greenford, Middlesex.

The Brockmoor Fdy. Co., Ltd., Staffordshire.

Richard Elsdon, Librarian, Iron & Steel Institute, London.

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South Milwaukee, Wis.
President
Wisconsin Chapter

FOUNDRY *Personalities*

Franklin P. Goettman, formerly research manager for George F. Pettinos, Inc., Philadelphia, recently joined Durirron Co., Inc., Dayton, Ohio, as sand foreman. A graduate of Pennsylvania State College, Mr. Goettman is a member of the Sand Division's Core Washes and Pastes, Green Sand Properties and Grading & Fineness Committees.

James R. Hewitt, formerly vice-president in charge of operations for the American Manganese Steel Division of the American

J. R. Hewitt

Brake Shoe Co., was recently appointed Texas and Louisiana sales representative for the National Engineering Co., Chicago. He will make his headquarters in Houston.

Anthony Derrick, formerly assistant superintendent of the American Brake Shoe Co.'s Mahwah, N. J., plant, has been appointed superintendent. Mr. Derrick, who has studied Metallurgy at Chicago's Lewis Institute and the Armour Institute of Technology, began as a core-maker learner with Brake Shoe's Melrose park (Chicago) plant in 1925.

J. T. Asquith recently succeeded Lyle McCoy, retired as vice-president and general manager of the Canadian Car & Foundry Co., Ltd., Montreal. Widely-traveled, Mr. Asquith has assisted with the development of railways and industries in the Orient.

C. Boone, for four years manager of the Industrial Foundry Supply Co., San Francisco, has been made sales and service engineer for the Texas Steel Co., Fort Worth.

Ray H. Moore has joined the staff of the Claude B. Schneible Co., Detroit, as a special consultant. Mr. Moore has been in foundry work since 1916, and has been consulting engineer for the W. W. Sly Co.; manager of the Consulting Engineering Division of the National Engineering Co.; and manager of the Equipment Division of the Whiting Corp.

W. E. MacMullan has been made general manager of the Monessen Foundry Division of the Rockwell Mfg. Co., Pittsburgh. Mr. MacMullan was formerly in business for himself as a manufacturers' agent in the mining equipment line.

W. E. Mahin, chairman of metals research at the Armour Institute of Technology, Chicago, has been named director of research. Mr. Mahin will head a group of 411 scientists, engineers and technicians who are at present working on 125 active research projects for industrial and Government sponsors. Mr. Mahin succeeds Dr.

W. E. Mahin

Martin H. Heeren, who will be director of applied research with the sapphire division of the Elgin National Watch Co., Aurora, Ill. Mr. Mahin is a member of A.F.S., ASM, AIMME and the British Institute of Metals and Iron and Steel Institute.

J. E. Nelman, for 15 years general manager of the Aluminum Department of the Federated Metals Division of the American Smelting & Refining Co., and president of the Aluminum Research Institute, has joined the executive staff of the U. S. Reduction Co., and will make his headquarters in Detroit.

J. W. Primeau of Merriton, Ont., has been elected president of the newly-established B-W-H Service Parts, Ltd., Merriton, formed to distribute Borg-Warner automotive replacement parts throughout Canada. Mr. Primeau is also vice-president and general manager of Hays Steel Products, Ltd., Merriton. Other newly-elected officers of the company are Vice-President **J. W. DeLind, Jr.,** of Chicago and Detroit; and **Secretary-Treasurer E. P. McGavin** of Merriton.

James E. Reynolds, Jr., will begin work this month as an instructor in Metallurgical Engineering at the Massachusetts Institute of Technology and at the same time will work toward his doctorate. Mr. Reynolds, who until this spring was an instructor in Metallurgical Engineering at the Missouri School of Mines, Rolla, served as faculty advisor to the A.F.S. Student Chapter there.

Watson P. Hall, a member of the Service Engineering staff of the American Wheelabrator & Equipment Corp., Mishawaka, Ind., was recently assigned to the company's Toronto, Ont., sales office. He is a graduate of McGill University, Montreal.

Benjamin S. Sampson has been appointed manager of the Claud S. Gordon Co.'s Industrial Furnace & Oven Division.

B. S. Sampson

Mr. Sampson was formerly district sales manager of the Stewart Furnace Division of the Sunbeam Corp., Chicago.

Leonard G. Daniels, who was recently screened from more than a dozen top-ranking June graduates of the Case Institute of Technology by Precision Metalsmiths, Inc., Cleveland, will head that firm's newly-created Engineering Design department. Mr. Daniels' schooling at Case was interrupted by his entry into the Army in 1942, where he studied at Muskingum College under the Army Specialized Training Program, and for five months studied chemistry at the University of Munich, Germany, prior to returning to Case to complete his studies.

Lawrence E. Emery has joined Benton Harbor Malleable Industries, Benton Harbor, Mich., as plant metallurgist, the position he held in the Ashtabula (Ohio) plant of Lake City Malleable Co.

A. J. Fruchtl, formerly assistant to the vice-president in charge of operations for the U. S. Pipe & Foundry Co., Burlington,

A. J. Fruchtl

N. J., was recently appointed resident manager of that company's North Birmingham, Ala., plant. Mr. Fruchtl was associated with the Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., prior to joining U. S. Pipe & Foundry.

Kurt A. Miericke, formerly precision castings development engineer with the United States Gypsum Co., Chicago, announces the establishment of his own consulting engineering practice. Mr. Miericke will specialize in permanent mold design, precision plaster casting, and pressure cast aluminum matchplate applications. He is a member of the A.F.S. Plaster Mold Casting Committee and has been a frequent speaker at local, regional and national meetings of the Society on the above subjects. Mr. Miericke has established offices at 830 Elmwood Ave., Evanston, Ill.

The Air Reduction Sales Co., New York, announces the following new appointments to its engineering and sales staffs: **L. B. Dobbins,** to be supervisor of plant engineering; **J. B. Davenport,** to be assistant manager of the Charlotte, N. C., sales district; **J. H. Hart,** to be assistant sales manager of the Detroit sales district; and **A. S. Blodget, Jr.,** to be assistant manager of the Boston district.

Wells Manufacturing Co., Three Rivers, Wis., announces the appointment of three men to executive positions in its Engineering department: **Martin J. Verhuel,** to be chief product engineer, Meat Saw Division; **Erwin Tobler,** to be chief product engineer, Metal Saw Division; and **David T. Evans,** to be research engineer for both Divisions.

William S. Lowe, formerly chairman of the board and president of Reeves-Ely

(Continued on Page 89)

A. F. S. CHAPTER DIRECTORY

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WESTERN NEW YORK CHAPTER *Secretary,* R. E. Walsh, Hickman, Williams & Co., 32 Eastwood Place, Buffalo, N. Y.

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UNIVERSITY OF MINNESOTA

MISSOURI SCHOOL OF MINES *Secretary,* Martin L. Slawsky

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TEXAS A & M COLLEGE *Secretary,* Victor C. Henkel

CHAPTER ACTIVITIES NEWS

Birmingham District

J. P. McClendon
Stockham Valves & Fittings
Publicity Chairman

THE FIRST MEETING of officers and directors for the 1949-50 season was held at the Tutwiler Hotel, Birmingham, July 19. This was a dinner meeting, with C. P. Caldwell, Caldwell Foundry & Machine Co., Chapter Chairman, as host to the group.

The directors approved holding one program meeting each in Anniston and Tuscaloosa during the winter months. This will accomodate a large number of members who travel to Birmingham for the Chapter's monthly meetings.

After much discussion, pro and con, it was decided to hold a social hour before each meeting. The social hour, dinner and technical session will provide opportunity for fellowship, as well as for technical discussion of problems of mutual interest to Chapter members.

The Birmingham Regional Conference was scheduled for February 9-10, 1950.

The following committee chairmen were appointed at the meeting: *Program*—Morris Hawkins, Stockham Valves & Fittings; *Entertainment*—E. A. Brandler, Electro Metallurgical Division, Union Carbide & Carbon Corp., *Registration*—W. W. Hazzard, Kirchner, Marshall & Co.; *Visitations*—Ray Frings, Central Foundry Co.; and *Publicity*—J. P. McClendon, Stockham Valves & Fittings, Inc.

"Play Ball!"—a close one during a softball game at Western Michigan Chapter's Annual Picnic.

Those in attendance at the Director's meeting were: Chairman C. P. Caldwell, Caldwell Foundry & Machine Co., Inc.; Vice-Chairman Morris Hawkins, Stockham Valves & Fittings, Inc.; Secretary-Treasurer Fred K. Brown, Adams, Rowe & Norman, Inc.; A.F.S. National Director T. H. Benners, T. H. Benners & Co.; Chapter Directors Dr. J. T. MacKenzie, American Cast Iron Pipe Co.; H. W. Gethin, Alabama Clay Products Co.; R. R. Deas, Hamilton Research Co.; B. W. Worthington, McWane Cast Iron Pipe Co.; Donald Abbott, Hill & Griffith Co.; D. C. McMahen, Harbison-Walker Refractories Co.; J. A. Bowers, American Cast Iron Pipe Co.; Entertainment Chairman E. A. Brandler, Electro Metallurgical Division, Union Carbide & Carbon Corp.; and Registration Chairman W. W. Hazzard, Kirchner, Marshall & Co.

Chairman Caldwell and Secretary-Treasurer Brown reported on the recent Chapter Officers' Conference, held in Chicago.

Central Indiana

W. K. Mitchell
L. W. & W. K. Mitchell
Chapter Reporter

A CHAPTER DIRECTOR'S MEETING, presided over by Chairman S. Franklin Swain, Golden Foundry Co., Columbus, Ind., was held August 1 in the Athenaeum, Indianapolis. Ten directors and officers attended.

Primary objectives of the meeting were discussions of new methods of maintaining Chapter membership levels, and plans for the Annual Picnic and Outing, to be held September 10 at the Lakeshore Country Club, Indianapolis.

It was decided that plans for bringing in new Company and Sustaining memberships to the Chapter be worked out in detail by the Membership Committee,

The "Big Top" used as a dining hall (center photo) at Western Michigan Chapter's Annual Picnic required plenty of husky foundrymen to put it up (left) and take it down (right) when the picnic was over.

A few of the foundrymen at Western New York Chapter's Annual Stag Outing, held near Buffalo, June 25.

and presented at the next Directors' Meeting for approval and action.

Plans for the Picnic and Outing, as presented by the Picnic Committee, were reviewed and approved by the Board.

Carl Schopp, Link-Belt Co., Indianapolis, was appointed chairman of the new Educational Committee, which is expected to submit educational plans for the coming year at the next Directors' Meeting.

Western Michigan

Rolfe Jenkins
Campbell, Wyant and Cannon Foundry Co.
Chapter News Editor and Photographer

Foundrymen from the Western Michigan Chapter gathered at Pontaluna Golf Course, outside Muskegon, for a long, fast-moving day's entertainment August 20. There were 824 persons registered at this year's picnic.

Before 8:00 o'clock in the morning there were golf balls in the rack for foursomes waiting to get started. By evening, 148 members had played the 18 holes.

Meanwhile, Secretary Ross Shaffer Lakey Foundry and Machine Co., and Treasurer Laurin Ramsey, Paul M. Wiener Foundry Co., both of Muskegon, set up the registration desk and started the rest of the program.

Softball, Pateka-Rio and horseshoes interested 65 people in participating and more in watching.

Robert Turner, Gulf Refining Co., was the day's master of ceremonies, calling off all events and introducing guests.

Ham and potatoes, salad, coffee and ice cream made up the menu at dinner, served under two large tents, erected for protection in case of rain.

After prizes were awarded in the evening for the best golfers and for lucky registration card holders, C. H. Jacobson, Dake Engine Co., Grand Haven, chairman of the chapter, brought on the professional entertainment, composed of four acts, including a vocalist from Muskegon.

Stanley H. Davis, Campbell, Wyant and Cannon Foundry Co., vice-chairman of the Chapter; Webb Hallberg, Lakey Foundry & Machine Co., and Carl Anderson, directed the serving of the dinner.

Central Ohio

H. W. Lownie, Jr.
Battelle Memorial Institute
Chapter Reporter

APPROXIMATELY 200 MEMBERS and guests of the Central Ohio Chapter met at the Brookside Country Club, Columbus, August 12 for the Chapter's Fifth Annual Outing.

Afternoon activities centered around golf, bait casting, baseball and dart throwing. With the exception of one unfortunate group of golfers, everyone was successful in finding shelter from an unscheduled downpour, which thoroughly soaked the grounds.

Evening activities commenced with a satisfying chicken dinner and the awarding of about 80 door prizes, ranging from fishing reels and golf balls to sport shirts and thermos bottles.

The outing concluded with the presentation of about an hour-and-a-half of professional vaudeville and entertainment.

Northern California

Jack F. Mainzer
Pacific Brass Foundry
Publicity Chairman

A NEVER-TO-BE-FORGOTTEN evening was the Northern California Chapter's Annual Ladies' Night, held June 17 at the St. Francis Yacht

Prominent foundrymen and foundry equipment suppliers enjoying an al fresco dinner under the big tent serving as dining hall at Western Michigan Chapter's Annual Picnic, August 20.

Graduates of Tennessee Chapter's 15-Week Foundry Practice Course who posed for this photograph at a dinner June 17 climaxing the course were: first row, seated, left to right, Thomas Deakins, Clyde Riggs, John Lasiter, Carl Barker, Knox Riley, John Gryder and Donald Andrews. Second row: A. Imms, C. E. Jones, George Hesse, J. D. Cliett, Jr., Wilmer Lawrence, Charles Chisholm. Third row: Thomas Alford, Harry Nelson, Samuel Leventhal, Wallace Erb, John Kosik and Robert Young.

Club, overlooking San Francisco Bay and the Golden Gate.

Speeches were held to a minimum, and a tooled-leather briefcase was presented to outgoing Chapter chairman George McDonald, H. C. McCauley Foundry Co., Berkeley. Samuel Russell, Phoenix Iron Works, was awarded a surprise package of 100 flashbulbs in recognition of his work as Chapter photographer.

After the banquet was concluded, there was dancing for the balance of the evening.

The Chapter's Entertainment Committee, headed by J. M. Snyder, Abrasive Division, Musto Sons, Keenan Co., is to be commended for its efforts in making Annual Ladies' Night a success.

Twin City

J. D. Johnson
Werner G. Smith Co.
Chapter Reporter

A LARGE TURNOUT of 190 members and guests helped make the Twin City Chapter's Annual Golf Party a success. Held at the Midland Hills Country Club July 25, the party featured golf in the afternoon and dinner and entertainment in the evening. A guest, Elmer Foss, turned in a low golf score for the day—75, and Paul Kordiak of Scott-Atwater Foundry Co. had the low score for member golfers.

Following an excellent dinner, prizes were awarded eight golfers and several prizes were raffled off. David Gramling, Northwestern Marble Corp., won both a golf and raffle prize.

The Annual Golf Party proved highly successful and credit is due Chairman Francis Marrin, Marrin Foundry, and the Chapter's Entertainment Committee.

Central Michigan

A. J. Stone
Albion Malleable Iron Co.
Publicity Chairman

CENTRAL MICHIGAN CHAPTER'S Summer Outing was held May 28 at Waterworks Park, Coldwater, Mich.

Beginning at 11:00 a.m., the Outing featured an airplane ride for members and guests interested. Following a buffet lunch, golfers left for the Coldwater Country Club, while two strenuous games of baseball were organized. The first game was won by the "Rinkydinks" by a score of 10-2, and the second by the Albion Malleable Iron Co. team by a score of 21-6.

Late in the afternoon, following the golf and baseball games, an amateur contest was held in Waterworks Park. Winner of the Contest was Grover Tourville, maintenance superintendent of the Albion Malleable Iron Co., Albion, whose rendition of "Sonny Boy" won him a table model radio.

The drawing for door prizes was followed by dinner and an evening of entertainment.

Credit for the highly successful outing is due to the efforts of the Entertainment Committee.

Retiring Chairman Alexander C. Andrew, American Locomotive Co., Schenectady, pictured recently as he turned over the chairmanship of the Eastern New York Chapter to his successor—Kenneth F. Echard of Eddy Valve Co., Waterford.

George Grimm, Lakey Foundry & Machine Co., Muskegon, won the day's most coveted prize—a $185 set of golf clubs—at Western Michigan Chapter's Annual Picnic, held August 20 at Pontaluna Golf Club.

FOR FASTER PRODUCTION OF...

Better, Cleaner Castings

STEEL, MALLEABLE, GREY IRON, NON-FERROUS USE...

DELTA CORE & MOLD WASHES

Three easy-to-understand reasons why more foundries use DELTA Core and Mold Washes . . .

1. MORE PERFECT CASTINGS . . . 2. LOWER CLEANING ROOM COSTS . . .

3. LESS SCRAP IN MACHINING.

HERE'S WHY...

a. Delta Core and Mold Washes "Anchor" themselves by penetrating from 3 to 5 grains deep into the sand. This bond between the wash and the sand . . . a distinctive DELTA characteristic . . . produces an expansion-resisting coating essential to the production of finer finished castings.

b. The hot strength of Delta Core and Mold Washes increases with each degree of temperature rise from 1800°F to 3000°F providing maximum critical hot strength for all foundry applications.
The higher hot strength of DELTA Core and Mold Washes eliminates surface sand fissuring, excessive sand expansion and distortion.

c. No gas leakage through Delta Core and Mold washed surfaces. Gases produced by decomposition of organic binders in the core sand cannot leak through Delta Core and Mold washed surfaces to contact the molten metal. Only Delta Core and Mold Washes provide this unique and all-important insurance against defective castings resulting from core gas leakage. DELTA Core and Mold Washes insure more perfect castings with finer finished surfaces.

DELTA CORE & MOLD WASH-BASE
Mix with silica flour and water to produce finished wash.

•

FOR STEEL
STEELKOAT — Special Core and Mold Wash.

•

FOR GREY IRON & MALLEABLE
Grakoat — Blackoat — Hi-temp.

•

FOR NON-FERROUS METALS
Non-FerrusKoat.

•

FOR ALL SAND CAST METALS
THERMOKOAT — It's Plasti-Lastic.
PYROKOAT-Hi-Speed.

•

FOR UNUSUALLY HIGH TEMPERATURE CONDITIONS
Z-KOAT-High-fusion-temp wash.

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• *Ask for a liberal working sample.*

There is no "just as good" substitute for any DELTA Core and Mold Wash just as there is no substitute for DELTA'S scientific laboratory control of production which safeguards the quality and uniformity of all DELTA Foundry Products. DELTA Research laboratories developed, and pioneered the use of, Plastic-type Core and Mold Washes . . . and still leads the field in the development of new products for improved foundry practices.

DELTA OIL PRODUCTS CO.

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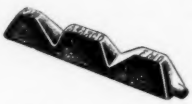
Photo by Toby Chaduvich JMLco F131

Profitable New Product Invented by Foundry...



A sound idea, engineering skill, and the *right* Federated metals for its cast components are combined in the LITTCO ELECTRIC MOWER, manufactured by the Littlestown Hardware and Foundry Company, Inc., Littlestown, Pa.

Competent design and liberal use of castings made of Federated aluminum alloys have resulted in the production of a 24 lb. electric lawn mower which, although it requires only one hand to operate, will cut grass up to 15 inches high with no trouble.

Eighteen parts of the mower, including the sides, the housing, wheels, back rollers and brackets, are cast of Federated TENZALOY and Federated F-720, the former being used where extra high strength is demanded.

TENZALOY is produced only by Federated Metals. It is an aluminum alloy which gives high strength without heat treatment, as-cast strengths reaching 30,000 psi., and still higher with 10-14 days aging at room temperature.

For TENZALOY . . . for any non-ferrous alloy, including aluminum, magnesium and copper-base foundry metals; solders; bearing metals; and fabricated lead products . . . see Federated first.

Federated first in the non-ferrous field FMD

Federated METALS DIVISION

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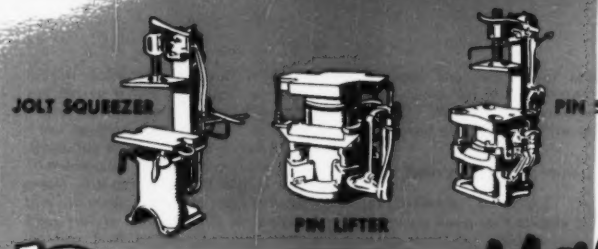
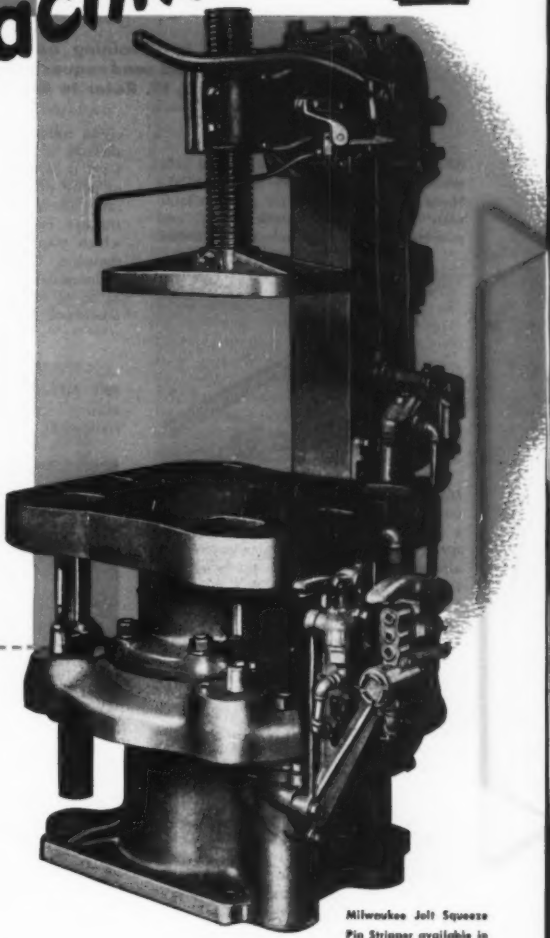


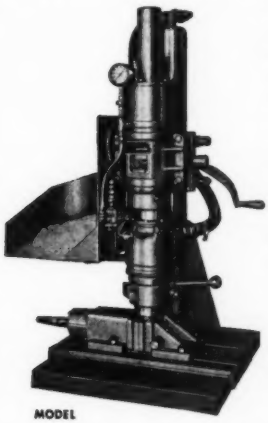
3 Molding Machines in 1

Here's a molding machine that's really versatile. The Milwaukee Jolt Squeeze Pin Stripper operates as a Jolt Squeezer . . . Pin Lifter . . . or Pin Stripper. It's like having three molding machines in one.

The drawing mechanism can be operated on the exhaust of the squeezing stroke as a Stripper, or as a separate operation after squeezing as a Pin Lift. The machine handles simple, inexpensive pattern equipment, enabling you to put troublesome short-run jobs on fast production schedules. It is machined to close tolerances and is accessible from all three sides. Write for complete information on this modern, versatile "Triple Threat" molding machine. 5 sizes available. Ask for Bulletin No. 110.



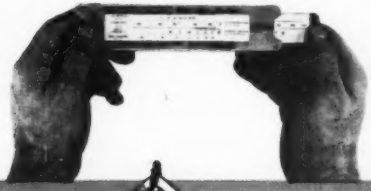
Milwaukee Jolt Squeeze Pin Stripper available in 5 sizes.



MODEL NO. 3A

30% More Blow Pressure with Milwaukee-Taccone Bench Style Core Blower

This modern, bench style machine blows intricate cores up to 4 lbs. in weight. Synchronized clamping and blowing increase speed and efficiency. Blown cores automatically released, can be removed as fast as blown. Blower steps 90 lb. line pressure up to 120 lbs. blowing pressure. Also heavy duty Core Blower with 100% more blow pressure. Ask for Bulletin No. 119A.



Piston Size Calculator

Milwaukee Foundry Equipment Engineers have devised this handy calculator for determining the uniform mold hardness and size of squeeze piston. It's FREE! Send for your Calculator — today!

CORE BLOWERS • CORE GRINDERS • MOLDING MACHINES • BRIQUETTING PRESSES

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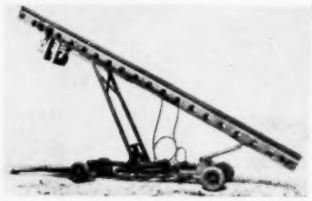
NEW Foundry Products

Readers interested in obtaining additional information on items described in New Foundry Products should send requests to Reader Service, American Foundryman, 222 W. Adams St., Chicago 6, Ill. Refer to the item by means of the convenient code numbers.

Hydraulic Conveyor Control

SP1—Lightweight, portable Tote-All belt-conveyors, manufactured by the Lake Shore Engineering Co., are now available with hydraulically-controlled belt and mounted on a new hydraulically-controlled



Duc-Lift frame. The hydraulic system is powered with either an electric motor or a gasoline engine. Hydraulic control of speed permits reversing action of belt and a range of speeds from 0 to 400 fpm. Duc-Lift frame, mounted on four wheels with 4:00 x 8 pneumatic tires, permits wide variety of positions for conveyor. Height of low end of conveyor can be adjusted from 20 to 48 in. and high end from 48 in. to 15 ft, depending upon conveyor length. Tow bar permits pulling by hand or vehicle. Standard conveyors are available in lengths from 10 ft up, in multiples of 2 ft, and with belt widths of 8, 10 and 16 in.

Combustion Boats

SP2—Lecotherm, a lightweight, one-use ceramic combustion boat employed without bedding material for rapid carbon and sulphur combustion analyses, is announced by the Laboratory Equipment Corp. Carbon and sulphur blank free, Lecotherm possesses slag penetration resistance. These combustion boats are packaged in individual contamination-resistant packs of 10 boats each, enclosed in a master carton of 1000 boats. Boats can be used in most instances directly from individual packages without burning off to remove blank. Boats are $3\frac{3}{4}$ in. long x $\frac{1}{2}$ in. wide x $\frac{7}{16}$ in. high. Also available in lots of 100 at pro rata cost.

Compressed Air Separator

SP3—The James B. Murphy Co.'s Paragon C compressed air separator is designed to remove all traces of oil, moisture and dirt from compressed air at point of use in such operations as blowing-out of precision units, blowing dust from polished surfaces or surfaces subject to corrosion. Unit is installed in pipe line just ahead of point of delivery, where strainer separates air and moisture. Air then rises through two cotton felt absorbent pads, which trap final traces of oil, grit and moisture. Unit No. 1, measuring $5\frac{1}{4}$ x $8\frac{1}{2}$, accomodates inlet and outlet pipe sizes of $\frac{1}{8}$ to $\frac{3}{8}$ in., and delivers to $\frac{1}{8}$ in. pipe nozzle only.

Grinding Wheels

SP4—Fibrex Red Wheel, a new type of synthetic resin bonded grinding wheel is claimed by its manufacturer to have extra

strength and durability. Manufactured from laminated sheets of cotton fibre filled with abrasive grain, Fibrex wheels have a field of application between heavy grinding and light sanding, and can be used for abrasive cutting-off, deburring and finishing operations. Fibrex wheels are offered in 7 and 9 in. depressed-center types for use on portable disc sanders and right-angle portable grinders—and in straight wheels of 6, 8, 10, and 12 in. x $\frac{1}{8}$ in. thickness for cutting-off and general purpose use. Slightly flexible, the Fibrex wheel allows a certain amount of side pressure without wheel breakage. Manufacturer claims wheel has numerous advantages for weld grinding.

Belt Pulley

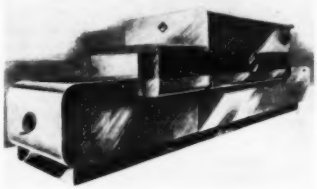
SP5—Designed for foundry elevator booths and belt conveyors having their greatest friction on crown of the pulley, the Popovich Belt Pulley has a renewable crown, which can be easily replaced without removing pulley from its place. Belt Pulley is equipped with dust-proof seals and ball bearings, which rotate on stationary shaft. The Popovich Belt Pulley also has an attachment which adapts it to any type of conveyor. Pulley is available fabricated from steel or cast iron, in flat or slotted types, in any desired dimension.

Steel Blasting Shot

SP6—American Wheelabrator & Equipment Co.'s new Tru-Steel shot, for use in all types of blast cleaning equipment, is a true steel that has received full blast treatment and consequently combines hardness and toughness. Manufacturer reports that carefully controlled tests reveal that Tru-Steel has such advantages over chilled iron abrasives as: (1) longer useful life (2) does not break down into fragments that will imbed in soft work (3) reduces wear on blast cleaning equipment (4) cleans at least as fast as chilled iron, and (5) costs less per ton. Tru-Steel shot is available for immediate delivery in all sizes. Brochure describing material in detail, test data and samples will be sent upon request.

Dielectric Core Dryer

SP7—Allis-Chalmers Mfg. Co.'s Foundromatic core drier is designed by the manufacturer to streamline foundry production and coordinate core room and molding floor operations. The Foundromatic unit consists of a radio frequency heater, an oven with electrodes, tuning



assembly, ventilating system and conveyors for loading and unloading. It is particularly adaptable where resin binders are used and is claimed by manufacturer to result in improved core quality, increased production, reduced costs, greater flexibility and better working conditions. Core making techniques need not be modified when changing from conventional oven methods to dielectric core drying. A fairly wide range of core sizes can be successfully handled by this method, since

heat is developed uniformly in the core and drying is not dependent on thermal conduction from an external heat source. Time involved varies from 2 to 20 min., depending on average size of core handled. Foundromatic core drier permits placing green cores on its in-feed belt as soon as they are made, and dried cores to be taken from belt to sorting table or directly to molding floor without cooling—eliminating need for storage and cooling racks. Unit is compact, easy to install, heats in 30 seconds, and needs only to be connected to power source.

Thermocouple Indicator

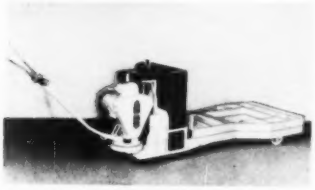
SP8—An economical, high temperature indicator for general, non-critical use has been announced by the Claud S. Gordon Co. Known as the Model XA-100 Xactemp Indicator, this indicator is accurate within a fraction of a scale division, and is calibrated for either Iron-Constantan or Chromel-Alumel thermocouples. A choice of several scale ranges is available. The indicator is furnished enclosed in a metal case suitable for either flush or surface mounting. A plug-in type lead-wire connection provides easy handling.

Light-Duty Overhead Conveyor

SP9—Jervis B. Webb Co.'s Junior Conveyor is designed to meet a need for a low-cost, small overhead conveyor for light jobs. The Junior Conveyor, using a 2 in. pitch chain, travels on a 3 in. I-beam held by bolted brackets attached either to supporting angles or tie rods. Structure is light and can be hung from average plant ceiling.. Conveyor may be assembled or disassembled without tools. Junior conveyor can be arranged to tie together operations of a several-floor plant—carrying parts through fabrication, assembly, painting, plating, finishing, baking, heat treating, etc. Where the conveyor runs through spray booths, loops can be arranged to dry the product. Similar loops can be arranged following baking ovens or furnaces to allow for cooling.

Walkie Truck

SP10—Moto-Truc Co.'s battery operated walkie truck, designed for the foundry industry, is operated by two 12-volt motors hooked in series, and features chain and



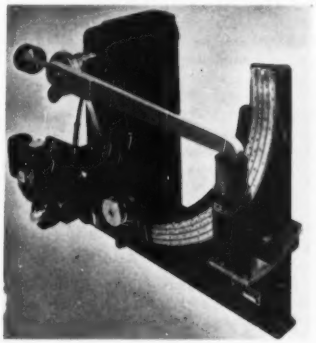
gear drive. Moto-Truc has an open platform for handling cores, and is 36 in. wide at widest part, tapering down to 27 in., and is 66 in. long. Turn of the wrist on MM roller-type handle gives two speeds forward and two speeds reverse. Push buttons on end of handle control hydraulic lift. Walkie truck had dead man controls and other safety features.

Heavy Duty Air Impact Tool

SP11—Largest of its type manufactured, Ingersoll-Rand Co.'s Slugger is rated up to 1 in. bolt size—work formerly done by sledging or battering box wrenches. This Size 588 impact tool is capable of handling both maintenance and production work, and is especially designed for fast repair of heavy equipment and to save time in the manufacture of all types of machinery involving large studs, bolts and nuts. Tool weighs 215 lb and has free speed of 355 rpm. with 550 impacts per minute. Standard equipment includes a safety live air handle with independent reverse, suspension ring and dead handle.

Core Test Accessory

SP12—A green core strength test accessory offered by the Harry W. Dietert Co., is designed to improve accuracy of green



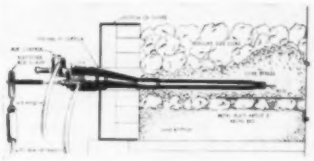
compression tests on relatively weak core sands. Specimen is stripped directly onto the accessory, reducing air dry time and assuring perfect seating on support post. Breaking strength is found by multiplying green compression scale reading by 10. Loading is applied at a controlled rate by the regular motor drive or by hand wheel.

Metal Distributor

SP13—Industrial Equipment Co.'s new Distributor enables one man to distribute and pour a much larger floor area than is possible with hand ladle pouring, when Distributor is used in conjunction with light cranes or trolleys. Available in two sizes, 700 and 1500 lb capacity, the Distributor features a worm and worm gear drive, which locks in any position and holds load without slippage. Moving parts, which are kept to a minimum, are fully-enclosed, sealed and run in a bath of oil, requiring only maintenance of oil level for lubrication. Other features—anti-friction bearings, rigid all-steel, all-welded unit, heat deflector for open top ladles. Each size is available in 2 ft, 2½ ft, and 3 ft lifts. Special lifts can be furnished.

Electric Coke Igniter

SP14—The Whiting-Mason Coke Igniter, a device that electrically ignites coke in the cupola without the use of wood, gas or oil for burning-in coke bed, is now being manufactured by the Whiting Corp. Especially adaptable to cities where cupola smoke nuisance ordinances are stringently enforced, the Igniter eliminates



the offensive odors and smoke usually associated with this operation. Manufacturer claims that large foundries save money with the Igniter through speed of ignition, and that smaller foundries realize savings by getting hot iron on the first tap. Other savings cited are those on kindling, wood storage, time and labor costs. The Igniter is so simple to operate that untrained men have successfully ignited coke beds on their first try. Unit uses compressed air and only one welding rod for each light, and requires only 15 to 25 seconds of power from either a small transformer or welding machine. Full information available.

Removable Pneumatic Vibrator

SP15—Cleveland Vibrator Co.'s Type UH pneumatic vibrator can be quickly attached to or removed from units requiring vibration, such as concrete forms, mold boxes, hoppers, bins, screens, flasks, and other applications where vibrator installation cannot be permanent. Unit is obtainable in a 2 in. piston diameter size and operates efficiently on 50 to 100 psi continuous line pressure. Number of vibrations per minute and intensity of vibration can be controlled by regulating air pressure. At 80 psi, unit develops approximately 1200 blows per minute, consuming about 10 cfm for continuous operation. Weight: 14 lb. Length: 6¼ ft. Height: 4 ft. Width: 3½ ft. Equipped with swivel hose fitting designed to receive ½ in. I.D. hose.

High-Speed Welding Electrode

SP16—Hobart Brothers Co.'s No. 313 is a class E-6013 electrode designed for making short, intermittent welds at high speed on all gauges of steel in any position, using either a-c or d-c, straight or reverse polarity. Electrode has fast operating characteristics, together with forceful spray-type arc, which can easily be started and restarted without scraping or hitting the electrode against the work surface. Hobart No. 313 electrode is available in 12 in. lengths in $\frac{3}{32}$ in. only, and 14 in. length in $\frac{1}{8}$, $\frac{5}{32}$ and $\frac{3}{16}$ in. sizes. Packed in standard containers of 50 lb each, except for $\frac{3}{32}$ in., which is packed in convenient 25 lb containers.

FOUNDRY Literature

Readers interested in obtaining additional information on items described in Foundry Literature should send requests to Reader Service, American Foundryman, 222 W. Adams St., Chicago 6, Ill. Refer to the items by means of the convenient code numbers.

Metalwork Publications

SP101—A 36-page list of metalwork publications and references is being distributed by Bradley University as its July Service Series Bulletin. The Bulletin lists books, pamphlets, free industrial reference and display materials and films. These are classified into 12 divisions for ready reference. The *"Teachers' Guide to Metalwork Publications and Reference Material"* is distributed free by the University. Included are sections on abrasives, grinding and polishing; forging and die casting, foundry work, general books and materials for metalwork, general machine shop work, heat treating and metallurgy, lathe work, milling, planing and drilling; sheet metal work and soldering, shop mathematics, tool and die making, and on welding practices.

Polishing Machines

SP102—Buehler, Ltd., has just published an eight-page, illustrated bulletin on AB Polishing Machines for the metallurgical laboratory. Described in detail and illustrated is the complete line of AB Polishers, and AB Polishing Assemblies Nos. 1540-3 and 1540-2. A complete line of laboratory polishing accessories is described and catalogued.

Electronic Core Baking

SP103—Induction Heating Corp. announces availability gratis of "A Report on Ther-Monic Core Baking Process," a four-page report issued by the Research Laboratory of the Compton & Knowles Loom Works, Worcester, Mass., detailing that company's experiences with electronic core baking. Reported are green handling, core making, baking, finished cores, finish, baked handling, collapsibility and shakeout, elimination of gas and smoke, availability of cores, over-baking, synthetic resin binders, contact dermatitis, sand problems, moisture pick-up and advantages as found by the research laboratory.

Oven-Recording Thermometer

SP104—A bulletin on the Bristol Co.'s Traveling-Oven Recording Thermometer describes the use of the instrument with various types of conveyor ovens to record finishing, lacquering, japanning, drying and baking temperatures. Illustrated with photographs and reproductions of typical chart records, Bulletin T842 also contains complete specifications and prices.

Melting Pots Catalog

SP105—A multi-colored, illustrated brochure depicting five types of Meechite melting, holding and tilting pots for use in aluminum foundries and die-casting plants, is available from the Meech Foundry. Included with the brochure is Specification Sheet 101-A, providing blueprint drawings of five different standard pot types. A special card is included which enables pot users to specify type and dimensions and to receive immediate price and delivery quotations without obligation to purchase equipment.

Blast Cleaning vs. Acid Pickling

SP106—An illustrated, informative bulletin, "How Wheelabrating Has Replaced Acid Pickling," published by the American Wheelabrator and Equipment Corp., describes the advantages and applications of airless blast cleaning equipment. Included in the booklet are several case histories. The 16-page booklet concludes with a detailed summary and comparison of the two metal cleaning processes.

Molding Machines

SP107—A four-page catalog describing 750 lb capacity series Hi-Speed Jolt Rollover and Draw Molding Machines, is announced by the Herman Pneumatic Machine Co. This catalog contains a series of photographs showing the machines in action in a number of different operating positions, and a blueprint diagram giving machine dimensions. A table shows capacity of machine at 80 psi, with 27, 33 and 39 in. arms, size of turnover plate, shipping weight, etc.

Aluminum Finishes

SP108—A new 124-page 6 x 9 in. book, "Finishes for Aluminum," furnishes basic information on the various processes for applying surface finishes to aluminum, as well as the characteristics of the finishes so produced. A revision of the two-volume book first published in 1946, "Finishes for Aluminum" brings the volume up to date by supplying new information and combines volumes I and II into a single reference book. The 1949 revision contains 124 pages, 37 illustrations, 26 tables, 3 indexes, and is wire bound to lie flat when opened. The book will be sent without charge to engineers, metallurgists, finishing department foremen and foundry officials requesting it on their company letterhead.

Malleable Iron

SP109—A brief, illustrated outline of the claims and qualifications of malleable iron to rank as the prime metal for manufacture of mobile equipment is Belle City Malleable Iron Co.'s four-page folder, "Essential Metal of a Mobile Age." Shown in the folder are the processes and strict controls that go into the making of malleable iron castings at Belle City. Seven desirable properties of malleable iron for mobile equipment castings are described.

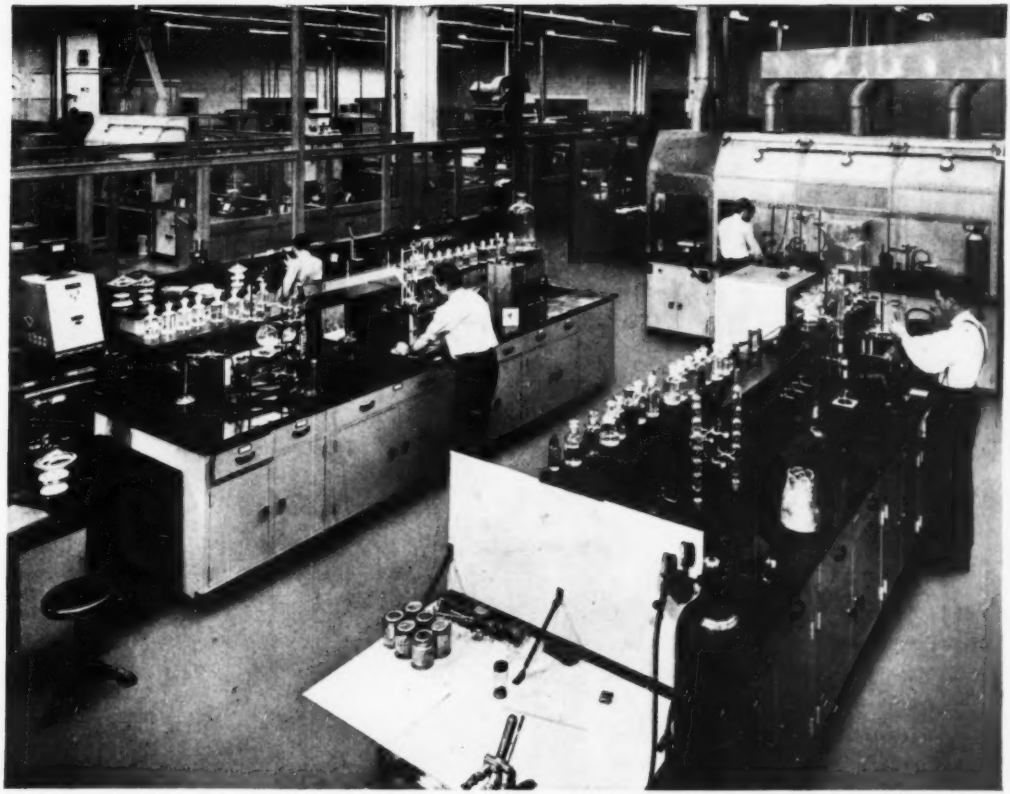
Phenolic Liquid Resin

SP110—General Electric Co.'s Technical Report CDC-20 outlines the properties, advantages and applications of G-E No. 12300 Phenolic Liquid Resin for foundry core binding. Also given are mixing instructions, typical formulation, spraying and baking instructions, costs and a list of G-E Chemical Department offices where samples of the product can be obtained.

FOUNDRY FILMS

"Men and Molds"

SP111—Lynchburg Foundry Co.'s new 16mm, black and white sound film, *"Men and Molds,"* is designed primarily as an employee indoctrination film, but also is a valuable sales and public relations tool for the foundry industry. The 35-minute film is based on a plant survey to determine the most vital operations in the company's Lynchburg plant—as a result the film clearly depicts important developments in the casting process, plus a scene in which the personnel director interviews a prospective employee, and one in which the company's Executive Committee is shown in session. Running comment by a professional narrator and background music contribute to this interesting and informative film. Available to A.F.S. Chapters and other interested groups at no charge except for postage to and from destination.



Making laboratory analyses of grinding wheels and abrasive materials

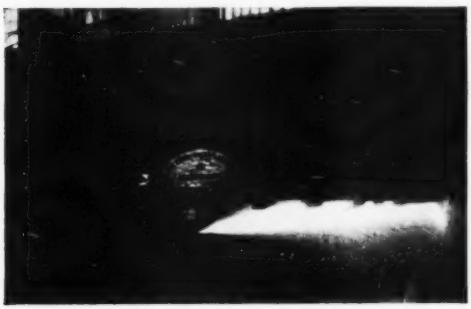
This is your grinding wheel laboratory

This is just one corner in the immense research and development laboratories of United States Rubber Company at Fort Wayne, Indiana.

Here "U. S." Abrasive Engineers work to lower your grinding wheel costs. They delve into every phase of bonds and abrasives, developing wheels that are more economical for snagging castings.

Their development work has revealed 5,000,000 possible combinations of size and construction. This means that they can produce the exact wheels you need for your conditions.

Take advantage of the "U. S." grinding wheel service. Write Grinding Wheel Dept., United States Rubber Company, Fort Wayne 4, Indiana.



HOW WOULD *You* PRODUCE

FULL-LENGTH HOLLOW CORES *in these Stainless Steel Castings?*

THE PROBLEM: These huge agitator blades for a leading manufacturer of plastics were specified in Cooper Alloy 17S, an austenitic chromium-nickel stainless steel corresponding in alloy content to Alloy Casting Institute's CF 8 designation.

Each casting, measuring seven and one-half feet in length, and weighing one thousand, five hundred and fifty pounds, was designed with a one and one-half inch hollow core running the full length . . . to provide a passage for water or steam with which to heat or cool the blade while in service.

Experience indicated that because of the unusual shape of the blades sand cores would be unsatisfactory and very unlikely to withstand the pressures and metal temperatures during casting.

HOW COOPER ALLOY FOUNDRY SOLVED IT: In place of a sand core, this foundry selected stainless steel tubing of the same composition as the cast alloy. Realizing that heat generated by the poured molten alloy would melt and deform the tubing, Cooper engineers developed a procedure whereby water was continuously forced through this stainless tube while the casting was being poured. Thus, the temperature was held below the melting point of the tube, and a satisfactory cored hole was assured.

Our casting specialists are always glad to help suggest suitable compositions of stainless alloys containing nickel for specific applications. Send us details of your problems for our suggestions.

EMBLEM OF INCO SERVICE

Over the years, International Nickel has accumulated a fund of useful information on the properties, treatment, fabrication and performance of engineering alloy steels, stainless steels, cast irons, brasses, bronzes, nickel silver, cupro-nickel and other alloys containing nickel. This information is yours for the asking. Write for "List A" of available publications.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

LETTERS

(Continued from Page 69)

irons and especially nodular irons. On returning, I experimented with magnesium and succeeded in producing an iron which showed a breaking load of 6,290 lb (1.52 in. diameter 18 in. centers) in spite of blow holes in the test box. Manganese and phosphorus were high—1.25 per cent and 0.25 per cent, respectively.

We have no facilities for testing in our works. One place for the necessary physical and chemical tests is Government Test House, Alipore, Calcutta, but it takes weeks to get one test carried out. The Test House has no metallographic facilities. The only other place is National Metallurgical Laboratory, Tatanagar, Jamshedpur, sponsored by the government of India. This is very well equipped but overloaded with work.

We cast a plain cast iron pan 9½ in. in diameter and 1½ in. deep having a section between ⅛ and ¼ in. I tried its strength by throwing it onto a solid stone floor from a height of 35 ft. The casting did not break.

I am working on an alloy cast iron which is soft and free cutting as cast but which can be made file hard by heat treatment. I cast a piece of this iron in the shape of a lathe tool having a ¾ in. square section. After heat treatment the tool machined mild steel. It is being used with satisfaction for turning brass.

A similar tool—3 in. long, 1½ in. wide, and ⅜ in. thick, ground at both ends—has been used on a boring mill to machine hand water pump cylinders of gray cast iron containing: C, 3.75; Si, 2.60; Mn, 1.5; and P, 0.5 per cent. As cast the cylinder had an inside diameter of 2 13/16 in. and it was bored and finished to a 3 in. diameter in a single cut. Speed of the boring bar was 50 rpm and it took nine minutes to finish the entire bore length of 5¼ in.

This tool bored 16 cylinders without regrinding. On the seventeenth cylinder the tool broke owing to carelessness of a worker and a bulge in the casting. Otherwise I feel the tool would have finished 50 cylinders.

MAN SINGH, *Proprietor*
Greysham & Co.
Delhi, India

Wants Blueprint Of Tiny Cupola

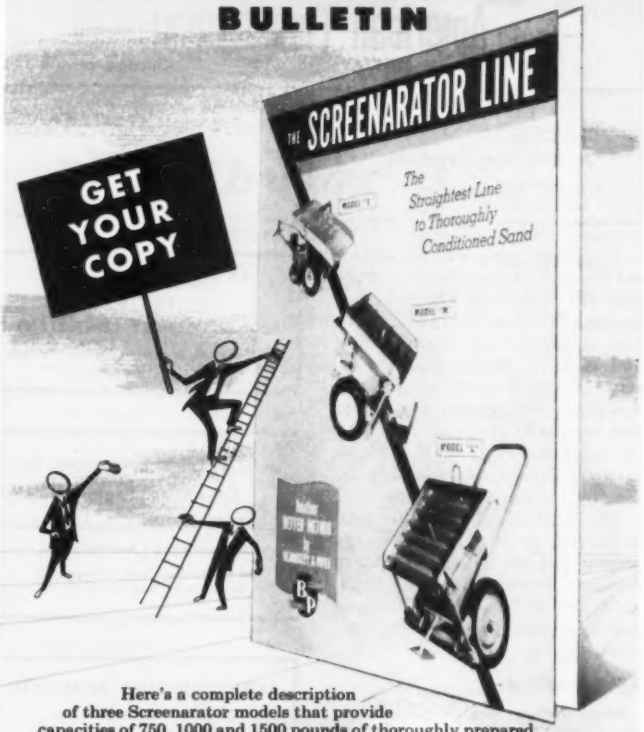
We have read of the experiments with a three inch cupola conducted by Dr. Fred C. Barbour and William M. Spradlin (AMERICAN FOUNDRYMAN, May, 1949, page 62) with very considerable interest. We are a steel foundry using the cupola-converter process and are interested in any related experimental work.

Will you forward our request for a blueprint of the cupola—offered by the authors—to the proper address?

WILLIAM HALLSWORTH
Thos. Firth & John Brown, Ltd.
Scunthorpe, Lincs., England

Others interested in a blueprint of the tiny operating cupola may obtain it from Dr. Fred C. Barbour, chief chemist, McWane Cast Iron Pipe Co., Birmingham 2, Ala. ***—Editor.***

NEW
SCREENARATOR
BULLETIN



Here's a complete description of three Screenarator models that provide capacities of 750, 1000 and 1500 pounds of thoroughly prepared sand per minute. The Screenarator line is engineered to produce screened, double aerated, lump free, fluffy sand . . . at lowest initial investment and lowest cost per hour of machine operation.

All types of foundries—ferrous and non-ferrous—**production and jobbing,** use Screenarators to meet their **needs for** thoroughly conditioned sand. Castings produced in screenarated sand are of the highest quality and finish.

Regardless of the size or type of foundry, **the Screenarator** pays for itself in a short **time. The** coupon below will bring you **the new** Screenarator bulletin or details **on free trial use of the Screenarator.**

SEND COUPON TODAY!

BEARDSLEY & PIPER
Division of Pettibone Mulliken Corp.
2424 North Cicero Avenue, Chicago 39, Illinois

☐ Send Screenarator Bulletin
☐ Send details on free trial use of the Screenarator

FOUNDRY
ATTENTION
TITLE
ADDRESS
CITY ZONE STATE

Beardsley & Piper are manufacturers of the Sandslinger • Speedslinger • Hydra-Slinger • Speedmullor • Mulbaro • Screenarator • Nite-Gang • Junior Nite-Gang • Preparator • B&P Champion Speed-Draw • B&P Plate Feeder • B&P Turntable • B&P Gyratory Screen

NOW AVAILABLE

THESE NEW SERVICES FOR READERS AND ADVERTISERS

- **Classified Advertising** — Rate $10 per column inch
- **Employment Service** (Position and Help Wanted) — Rates $5 and $10
- **Professional Card Advertising** for Engineers and Consultants — Rate $10 per column inch

American Foundryman

222 W. Adams St. Chicago 6

A. F. S. Employment Service

To contact firms seeking personnel through "Help Wanted" items write to American Foundrymen's Society, 222 West Adams St., Chicago 6, designating Item Number and issue of AMERICAN FOUNDRYMAN in which published. A.F.S. Applicant Registration Form then will be sent to applicant for filling in and returning to A.F.S. Headquarters. The form will then be sent by Headquarters to the firm.

All negotiations thereafter will be carried on directly between applicant and firm. Firms wishing to contact "Positions Wanted" applicants will be furnished with applicant's qualifications, name, etc., upon request.

HELP WANTED

HW508—Pattern Shop Supervisor: Need man to head 15-man pattern shop. Good opportunity. Non-ferrous foundry. Write, giving experience.

HW511—Sales Representative: Representative, 35 to 42, wanted to represent and introduce clays and sands in foundry and steel work for old established family firm. Will be trained in clays and sands in our laboratory. Should have at least high school education. Prefer man living in vicinity of Perth Amboy, N.J. Write, giving experience.

POSITIONS WANTED

PW118—Foreman or Superintendent: 26 years practical experience (foreman 16 years) in light, medium and heavy work, production and jobbing, gray iron and steel. Extensive machine molding experience, loose pattern bench and floor molding. Well versed in rigging, gating and feeding, molding and core sands, cleaning room and cupola. Good record handling men. Age 43.

PW119—Sales/Production: Recent metallurgical engineering graduate from large Mid western university. Veteran, 26, married, two children. Have a little gray iron experience. Desire start in sales or production that will lead to responsible position in company that promotes from within. Available now.

Professional Cards

Harold J. Roast
F.I.M., F.C.S., M.E.I.C.
BRONZE FOUNDRY CONSULTANT
15 Church Hill, Westmont 6, Que., Canada
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Chemists, Metallurgists, and
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Complete Testing Facilities
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Classified Advertising

FOR SALE: — Detroit Electric Furnace, 1000 lb. capacity. Type AA rocking, complete with 2300 V. primary transformer. Good working condition. Can be seen by appointment. Any reasonable offer considered. Contact W. Wilkinson, Hanson-Van Winkle-Munning Company, Matawan, New Jersey.

FOR SALE OR LEASE

Fully-equipped Non-Ferrous Foundry located in Detroit — going business — approximately 7000 square feet — building 30 feet high monitor type construction. Will sell or lease very reasonably. BOX 901, American Foundryman, 222 West Adams St., Chicago 6, Ill.

WANTED VOLUME 56 (1948) TRANSACTIONS

Due to an unprecedented demand, there are no more copies of Volume 56 (1948), A.F.S. Transactions for sale, either cloth or paper-bound.

Members who have no further use for their copies of Volume 56 or of Volume 48 (1940) A.F.S. Transactions are urged to write The Secretary, American Foundrymen's Society, 222 West Adams St., Chicago 6.

★ Sharper Castings
★ Greater Brinell Hardness
★ Increase Tensile Strength
★ Increase Transverse Strength
★ Increase Wear Resistance
★ Increase Heat Resistance

Copper Shot
IMPROVES YOUR IRON

ALTER COMPANY Fifty Years of Service
1741 Rockingham Road, Davenport, Iowa

PERSONALITIES

(Continued from Page 75)

Laboratories, New York, has been elected executive vice-president of the A. P. Green Fire Brick Co., Mexico, Mo. In addition to holding directorships and executive office in several manufacturing corporations in the East, Mr. Lowe is a director of the Connecticut State Manufacturers' Association.

Cameron R. Whitehorne has been appointed comptroller and **William F. Munday** deputy comptroller of the International Nickel Co. of Canada, Ltd., and its subsidiary, International Nickel Co., Inc., New York. Mr. Whitehorne succeeds **Frederick P. Bernhard,** who retired on August 1. Mr. Munday succeeds Mr. Whitehorne, who since 1933 has been deputy comptroller of both companies and of Whitehead Metal Products Co., Inc., an affiliate.

Dr. and Mrs. H. Ries are on a Western trip which includes stops in Salt Lake City and a number of places in California. Dr. Ries, former head of the Geology department of Cornell University and for many years a director of A.F.S. is head of the Sand Division. He will visit sand laboratories and foundries during the trip.

Edward R. Anderson has been appointed vice-president of the Kellogg Division of the American Brake Shoe Co., and will be located in the company's San Francisco offices. Mr. Anderson joined Brake Shoe in 1930, following graduation from Yale University's Sheffield Scientific School, and has been in the Engineering and Sales departments of the Brake Shoe and Casting Division since that time. He will continue to serve in his former position as Pacific District sales manager in addition to his new duties.

Frederick B. Riggan was recently appointed general manager in charge of manufacturing at the East St. Louis, Ill., plant of the Key Co. Mr. Riggan was advanced from the position of foundry superintendent, and will be succeeded by **Arnold E. Czechowicz,** formerly assistant foundry superintendent.

Charles W. Owens has been appointed superintendent of the Birmingham Works of the Harbison-Walker Refractories Co., Fairfield, Ala. Mr. Owens, who has been with Harbison-Walker since 1935, was superintendent of the Athens, Texas, plant from 1942 until 1944, when he joined the Navy. He joined the Birmingham Works upon his discharge from the Navy in 1946.

Robert H. Davies, consultant and Washington, D. C., representative for the Lincoln Electric Co., was recently appointed manager of engineering for the Baker-Raulang Co. He is a graduate in mechanical engineering of the University of Minnesota.

Douglas Jones, vice-president of the Utah Society of Engineers was made Salt

Announcing an

IMPORTANT IMPROVEMENT in POURING EQUIPMENT

INDUSTRIAL'S NEW

Distributor

Distributes Molten Metal

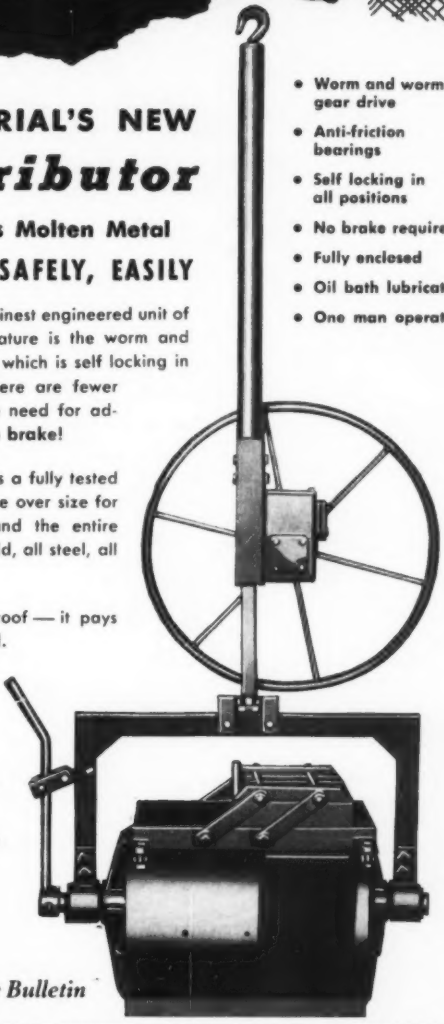
QUICKLY, SAFELY, EASILY

- Worm and worm gear drive
- Anti-friction bearings
- Self locking in all positions
- No brake required
- Fully enclosed
- Oil bath lubrication
- One man operation

Here it is — the finest engineered unit of its type. Key feature is the worm and worm gear drive which is self locking in all positions. There are fewer moving parts, no need for adjustment, **and no brake!**

The **Distributor** is a fully tested unit. All parts are over size for extra strength and the entire assembly is a rigid, all steel, all welded unit.

Here again is proof — it pays to buy **Industrial.**



SIZES:

The Industrial Distributor is available in 700# and 1500# capacities. 2, 2½, and 3 ft. lifts available in each size.

**Write for Descriptive Bulletin*

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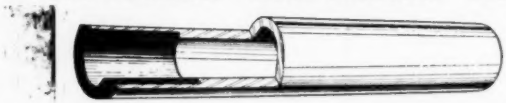
THE PETERSON "SAND ARRESTER" TUBE



The "Sand Arrester" tube is used in core boxes mounted on blowing machines having the draw feature. Blow tube sand column will not draw out of "Sand Arrester" tube. Cope side of core is ready for drier without patching, brushing or blowing off.

Ask your Foundry Supply Dealer to show you the PETERSON HOLINER BUSHING or "SAND ARRESTER" TUBE, or write for complete details.

MARTIN ENGINEERING COMPANY
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Lake City representative for the Chain Belt Co., Milwaukee, July 20. He will operate his business as the Douglas Jones Co., at 1551 Redondo Ave., Salt Lake City.

J. F. Fitzsimmons has been named manager of the Commercial Research department of the Allis-Chalmers Manufacturing Co., Milwaukee, succeeding **J. R. Reed,** who recently resigned to establish his own business. Mr. Fitzsimmons, a graduate of the University of Minnesota, has been with Allis-Chalmers since 1943, and supervisor of the department's Market Research section since 1946.

Shareholders of the Whiting Corp., Harvey, Ill., meeting on July 28, reelected **General Thomas S. Hammond** chairman of the board of directors and **Stevens H. Hammond** president of the company. **A. E. Bottenfield** was elected vice-president in charge of Merchandise Sales. All other officers of the company and the following directors were reelected: **General Hammond, Stevens H. Hammond, John Munro, J. Clyde Thomas, Col. John Slezak, John B. Dunbar, and John W. Cavanaugh.**

H. L. Bradbury has been appointed manager of Railway Sales for the Elastic Stop Nut Corp. of America, Union, N. J. Mr. Bradbury has been with the company since 1941.

George Grant, West Coast manufacturers' representative, has been made West Coast representative for the Wellman Bronze & Aluminum Co., Cleveland. Mr. Grant will handle sales of the company's complete line of magnesium, aluminum, bronze, permanent mold and sand castings. His address is Post Office Box 1072, Los Angeles 24.

OBITUARIES

Frederick H. Davis, manager of the Foundrate department of American British Chemical Supplies, Inc., New York, died at his home in Bloomfield, N. J., June 28.

Paul L. Becker, for over 18 years a foundry instructor in the Chicago Public Schools, died June 19. Born in Copenhagen, Denmark, Mr. Becker came to this country at the age of two, returning to Copenhagen to serve part of his foundry apprenticeship there. Mr. Becker served as financial secretary of Local 233 (Chicago) of the International Iron Molders' Union for 14 years, prior to joining the Chicago Public Schools as a foundry instructor. Mr. Becker was for many years active in the A.F.S. Chicago Chapter's educational work.

H. O. Magnuson, 59, manager and cofounder with his four brothers of the Champion Foundry & Machine Co., Chicago, died July 19. Prior to the formation of Champion, Mr. Magnuson was employed as a designer of molding machines with the Henry E. Pridmore Co. from 1904 to 1915.

Joseph F. Westendorf, 81, president of the Dayton Casting Co., Dayton, Ohio,

died June 6 of a heart attack. Mr. Westendorf, who was active in affairs of the company up to the time of his death, founded the company in 1909. Prior to that he was associated with the Martin Schneble Sons Co. and the Ohio Foundry Co.

Alfred Jamieson Miller, 72, chairman of the board of Whitehead Brothers Co., New York and Providence, R. I., died at his home in Newport, R. I., August 8 after a prolonged illness. Mr. Miller succeeded his father as New England manager for Whitehead in 1904, later becoming vice-president and treasurer, and in 1924 president of the company. He relinquished the presidency last year to become chairman of the board. Mr. Miller was one of the founders of the National Industrial Sand Association.

George E. France, chairman and managing director of August's, Ltd., Halifax, England, died July 15 in Blackpool, England.

Edward J. Burnell, 61, vice-president and general sales manager of the Link-Belt Co., Chicago, died July 22 at his home in Winnetka, Ill. Born in Tondu, Wales, Mr. Burnell was educated at Lehigh University. He served the Link-Belt Co. in many executive capacities in engineering, sales and plant management. He was a director of the Foundry Equipment Manufacturers' Association, the Conveyor Equipment Manufactures' Association, and the American Mining Congress.

Ralph W. Manzene, 37, sales representative for the Simonds Worden White Co., Dayton, Ohio, died June 4. Mr. Manzene was an active member of the A.F.S. Central New York Chapter.

Warren A. Smith, 61, a partner and co-founder of the Smith & Richardson Manufacturing Co., Chicago, died July 22. A graduate of Lewis Institute, Chicago, Mr. Smith was a machine designer for the Burgess-Norton Manufacturing Co. and the American Can Co., prior to forming his own company. An accomplished musician, Mr. Smith was a clarinetist in several amateur symphony orchestras in Illinois.

Franklin L. Whitcomb, from 1913 until his retirement in 1937 president of the Griffin Wheel Co., Chicago, died in Cotuit, Mass., July 26. He was 87. Mr. Whitcomb joined Griffin Wheel in 1889, serving as general sales agent and vice-president prior to assuming the presidency in 1913.

William H. Bahan, president and treasurer of the Bahan Textile Machinery Co., Greenville, S. C., died June 29 from injuries sustained in an automobile accident near his plant. A native of Massachusetts, Mr. Bahan founded the company in Charlotte, N. C., in 1917, and had been a resident of Greenville since the moving of his plant to Greenville 28 years ago. Well known in the textile field as an inventor and manufacturer, Mr. Bahan held patents on many labor saving devices in the textile field.

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FOUNDRY FIRM FACTS

Lynchburg Foundry Co., Lynchburg, Va., recently presented 15 graduates from its Lynchburg and Radford plants with certificates showing successful completion of Lynchburg Foundry Apprentice School's four-year course. Certificates were presented at the Annual Apprentice Graduation Dinner, held at Boonsboro Country Club, June 17. Macon P. Miller, Lynchburg's first supervisor of training and now director of Industrial Relations for Marshall Field & Co.'s Fieldcrest Mills Division, spoke at the dinner, while J. N. Byram of Richmond, representing the Apprentice Division of the Virginia Department of Labor was a special guest. Lynchburg President Harry E. McWane presided at the dinner and A.F.S. Past National President Max Kuniansky, vice-president and general manager, presented the certificates.

Light Alloys, Ltd., Renfrew, Ont., Can., an organization engaged in manufacturing magnesium castings for British and Canadian jet propulsion engines since 1946, was recently purchased by **Dominion Magnesium, Ltd.**, Toronto. The Hall Street Plant employs 150 men and recently added $250,000 worth of equipment.

Russell F. Lincoln & Co., 1058 Maplecliffe Drive, Lakewood, Ohio, has been appointed special representative to the foundry industry in the sale of Bell Prime Mover powered wheelbarrows and related products in the Northeastern Ohio territory of the Prime Mover Division of the **Bell Aircraft Corp.**, Buffalo, N. Y.

Independent Pneumatic Tool Co., announces the construction of new factory branch sales and service buildings in Chicago, New York, Pittsburgh and Toronto. The four new buildings, replacing previous office sites in the same cities, are completely equipped service stations staffed by factory trained engineers and are conveniently located sales headquarters.

The buildings and equipment of the **Lindal Foundry Division, American Gear Works**, plant at 5904 West Ogden Ave., Chicago, have been purchased by **Ogden Foundry, Inc.**, a firm newly-organized by four former officials of Love Bros, Inc., Aurora, Ill. Founders and executives of the new company are: Arthur K. Sanderson, president and general manager; Roy Frazier, vice-president and works manager; James W. Hawking, sales manager and treasurer; and Philip Wright, secretary. Ogden Foundry, Inc., is a gray iron foundry specializing in gears, pullevs and general jobbing.

Reginald M. Littlejohn, for many years sales manager for the William R. Barnes Co., Hamilton, Ont., purchased the **Hamilton Facing Mill Co., Ltd.**, 249 Hess St., Hamilton, August 15. Under Mr. Littlejohn's ownership, the company will act as Ontario representative for **Eastern**

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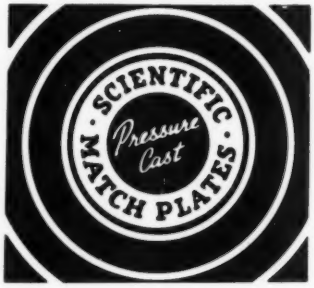

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The Magnesium Association announces the removal of its offices to the Chanin Bldg., 122 East 42nd St., New York.

Tamms Industries, Inc., is the new name of the **Tamms Silica Co.**, Chicago. Founded 38 years ago, Tamms was originally limited to producing silica. Since that time, its operations have been expanded to include manufacture and sale of water paints, colors and related products, and the new name is felt to be more indicative of the company's expanded activities.

American Smelting & Refining Co. recently celebrated its 50th Anniversary. Although ASARCO first came into being in 1899 as a result of the efforts of Henry H. Rogers, a colleague of John D. Rockefeller, the company largely owes its inception to one of the nineteenth century's most fabulous financiers—Meyer Guggenheim. A penniless immigrant, Guggenheim arrived in Philadelphia with a pack on his back containing pins, needles and notions. Within a few short years, he had become a wealthy man and invested his money in two Colorado lead mines. Guggenheim then branched into the smelting and refining business, and in 1902 purchased controlling interest in ASARCO. Since that day, the organization has become one of the world's largest producers of non-ferrous metals—from Antimony to Zinc. (From *Foundry Metals Digest*, published by the Federated Metals Division of the American Smelting & Refining Co.)

Sorbo-Mat Process Engineers announces that its mailing address has been changed to 3938 Lindell Blvd., St. Louis, 8. The telephone number is now Lucas 2616.

Burrell Technical Supply Co., Pittsburgh, has been officially authorized by the state of Pennsylvania to change its name to the **Burrell Corporation.**

Manhattan Rubber Division, Raybestos-Manhattan, Inc., announces that the world's largest precision hydraulic press for conveyor belts has just been put into successful operation in its Passaic, N. J., plant. Built to specifications by the Baldwin Locomotive Works, the press will vulcanize conveyor belts under controlled pressure and temperature. The assembled press weighs approximately 320 tons, and required a 150 ft addition to the plant to house it. Manhattan Rubber engineers developed the system of temperature and pressure controls to maintain a uniform condition on each platen of the huge press. Eight controllers operating individual control systems are synchronized to maintain proper temperatures during the vulcanizing process. A check of several platens has indicated that there is less than a two degree variation in temperature over any one platen surface, despite sudden and large load changes and a very large surface area.

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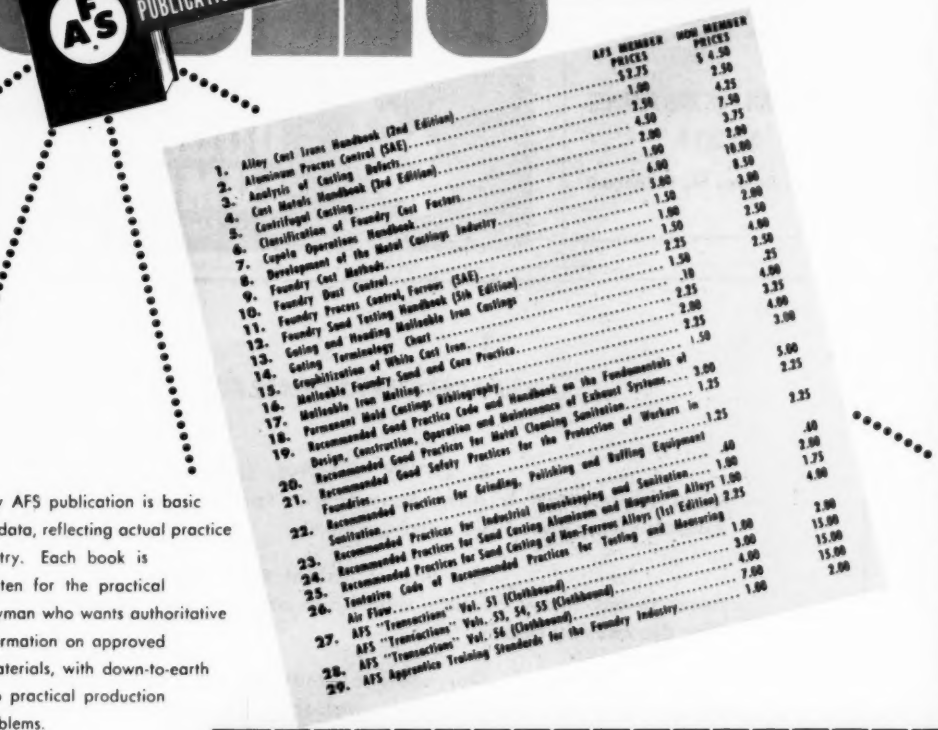

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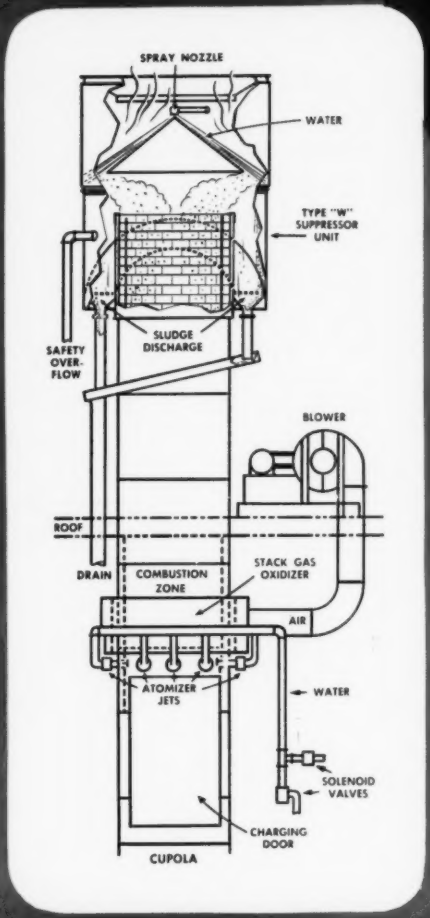

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